

# Pit and Quarry

**SAND-GRAVEL-STONE  
CEMENT-LIME-GYPSUM**



P & H Type 206  
¾ yd. capacity.  
Over 400 in suc-  
cessful operation.



## Where Steady Operation Counts

A minute before starting, the operator gives the motor a whirl and the P & H is ready for the all day job of excavating. The powerful crowding motion forces the dipper teeth through loose or hard soil in the shortest time, while the power clutch control eases the operator's work and hastens the control of all motions.

Write for Bulletin 82-X today

**HARNISCHFEGER CORPORATION**  
Successor to  
**PAWLING & HARNISCHFEGER CO.**  
Established in 1884  
3851 National Ave., Milwaukee, Wis.  
Offices and Agents in All Principal Cities.  
Warehouses:—New York, Jacksonville, Memphis, San  
Francisco, Los Angeles, Seattle



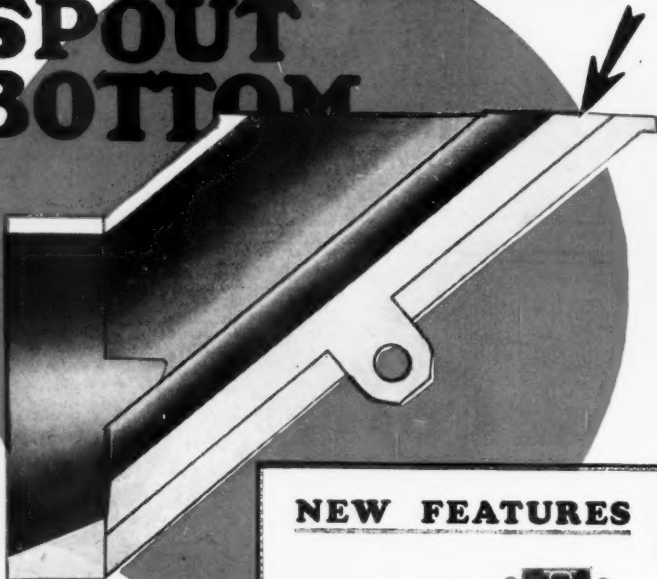
**SHOVELS**  
Gasoline - Diesel - Electric

January 15, 1926

Index to Advertisers . . . . . Page 43  
Table of Contents . . . . . Page 45  
Circulation 7,600

# REVERSIBLE SPOUT BOTTOM

We'll  
tell you  
about  
this re-  
newable  
end la-  
ter. →



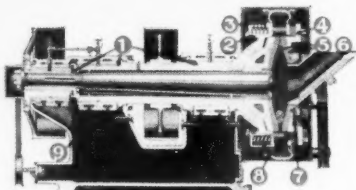
## —another new exclu- sive Symons' feature

Material entering strikes the upper section of the spout bottom with tremendous force—thus causing greater wear at this point. Soon the spout is worn thru, but only at one place,—with the old model an entire new spout was bought for replacement—a great waste of metal.

**Now**—Symons new reversible spout feature, which can be fitted to your disc crusher provides a separate bottom piece that can be reversed end for end—thus twice the life—and when necessary to replace you simply put in a new bottom only—this effects a big saving.

Ask us to tell you about it.

## NEW FEATURES



### SYMONS DISC CRUSHER

1. Choice of Bronze or Babbit Bearings.
2. Springs guarantee against breakage from non-crushable material.
3. One-piece hood liners and segment sides proportioned for minimum waste of metal.
4. Adjustment Shims for taking up wear and changing size of product.
5. Inner and Outer Discs interchangeable. Less waste.
6. Reversible bottom.
7. Manganese Fred Spout renewable end.
8. Renewable angle wearing ring.
9. Spring oil wipers—no oil leakage.

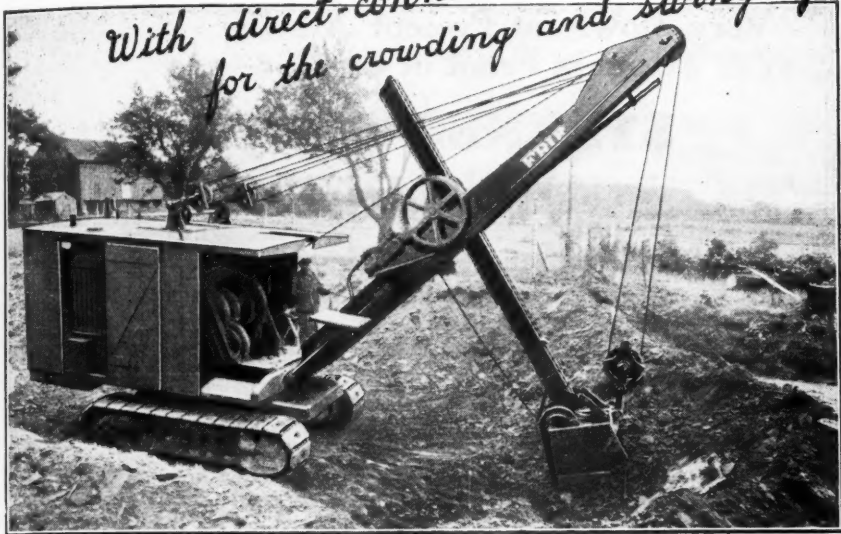
All above parts standard except springs on head which will be furnished when desired at reasonable additional cost.

**SYMONS BROTHERS CO.**  
ORE, ROCK AND GRAVEL CRUSHERS  
RAILWAY EXCHANGE BUILDING  
LOS ANGELES OFFICE  
1225 N. HAYDEN BLVD.  
HOLLYWOOD

MILWAUKEE, WIS.  
NEW YORK OFFICE  
100 BROADWAY  
NEW YORK CITY

# Gas Shovel

*With direct-connected air engines  
for the crowding and swinging*



getting entirely away from reversing friction drive on the "crowd" and "swing"

No slipping of swing and crowd clutches in and out—no gears and shafts turning all the time, wasting power and wearing fast. Instead, *direct-connected* double reversing air engines, that work only when crowding or swinging.

The air is supplied by a big heavy-duty compressor, so sturdy that dependable service is a *certainty*.

The heavy-duty gasoline engine—it has 5 $\frac{3}{4}$ "x8" cylinders—drives the hoist direct, and automatically operates the compressor whenever the shovel is neither hoisting nor traveling. It *stores up the power* that would otherwise be wasted. And the gas engine's exhaust heat is used to raise

the compressed air temperature to above 400° Fahr.

## Real Economy—and Bigger Capacity!

*Much faster*—digs 25% to 50% more than a single-engine shovel. Uses less gasoline per cubic yard dug.

*Digs harder material*—as the full power of hoist, crowd and swing can be exerted at the same time.

*Costs far less for repairs*—this gas shovel has no "reversing frictions" on the hoist, swing or crowd to keep adjusted and in repair. In *reliability* it's a real ERIE—structurally right.

See it at the American Road Show, Chicago, or get the facts in full; drop us a line for complete data.

**ERIE STEAM SHOVEL CO., ERIE, PA., U. S. A.**

Builders of ERIE Shovels, Cranes, Ditchers, Draglines, Trench Hoes, etc.

Branch Offices: Boston, New York, Philadelphia, Pittsburgh, Atlanta, Chicago  
Representatives throughout the U. S. A.

**ERIE**  
**GAS + AIR** Shovel and Crane

Fully protected by basic patents

Two Things Which Are Wearing Out Very,  
Very Slowly at Present Are the Old Foot  
Rail in Front of the Bar—and

## **STRENES CHUTES AND LINERS**

That STRENES satisfied the demand for lower costs  
is proven by this list of satisfied users

### **GRAVEL**

Arrow Sand & Gravel Co.	The Greenville Gravel Co.
Detroit-Oxford Gravel & Stone Co.	Keystone Gravel Co.
The Merom Gravel Co.	Terre Haute Gravel Co.
Willey-Ruckstuhl Gravel Co.	Wissota Sand & Gravel Co.

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Marble Cliff Quarries Co.	Ohio Marble Co.
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### **SLAG**

Standard Slag Co.

### **LIME**

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### **CEMENT**

The Southwestern Portland Cement Co., Osborn, O.  
The Wabash Portland Cement Co., Osborn, O.

### **EQUIPMENT MANUFACTURERS**

The Morris Machine Works, Baldwinsville, N. Y., manufacturers  
of Centrifugal Pumps.

### **MANUFACTURERS OF CENTRIFUGAL PUMPS**

The Ideal Concrete Machinery Co., Cincinnati, O., manufacturers  
of Cement Block Equipment.

Your request for Catalogue 26P will bring you complete  
information covering

## **STRENES, CHUTES AND LINERS**

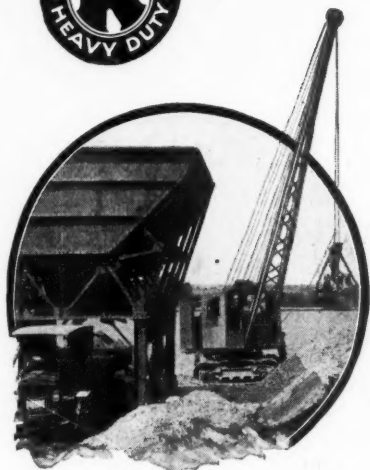
and ample proof of their ability to save you money

**WRITE RIGHT NOW!**

**The Advance Foundry Co., Dayton, O.**

# KOEHRING

## Crane



**H**OISTING, peaking, sluing, propelling; accuracy, ease and speed depend on the clutches.

The Koehring double outside band friction clutches give a new smoothness and accuracy to every operation as well as *Finger-tip control* at the operating levers.

Far greater clutch friction area gives remarkable ease and flexibility in operation — without losing the "feel" of the load — contributes to faster operation as well as to low maintenance and the elimination of clutch troubles.

Koehring clutch bands tighten from opposite sides of the drum, operating through an equalizing device which does away with all binding or side thrust on drum or bearing!

Go over the Koehring from multiplane to boom peak—you'll find Koehring improvement in design, Koehring Heavy Duty construction giving new factors to speed of operation, dependability, low maintenance and long service life.

Write for  
Crane Bulletin  
No. Cr. 32



### Crane Capacities

**No. 1**—1 cu. yd. clamshell bucket on 40 ft. boom or  $\frac{3}{4}$  cu. yd. on 45 ft. boom. Lifting capacity, 10 tons at 12 ft. radius. 4 cylinder, 5x6 in. gasoline engine, 1100 R.P.M.

**No. 2**—1  $\frac{1}{4}$  cu. yd. clamshell bucket on 45 ft. boom or 1 cu. yd. on 50 ft. boom. Lifting capacity, 15 tons at 12 ft. radius. 4 cylinder, 6x7 in. gasoline engine, 925 R.P.M.



## KOEHRING COMPANY MILWAUKEE WISCONSIN

PAVERS, MIXERS—GASOLINE CRANES, DRAGLINES AND SHOVELS

Sales Offices and Service Warehouses in all principal cities

Foreign Dept., Room 1370, 50 Church St., New York City.

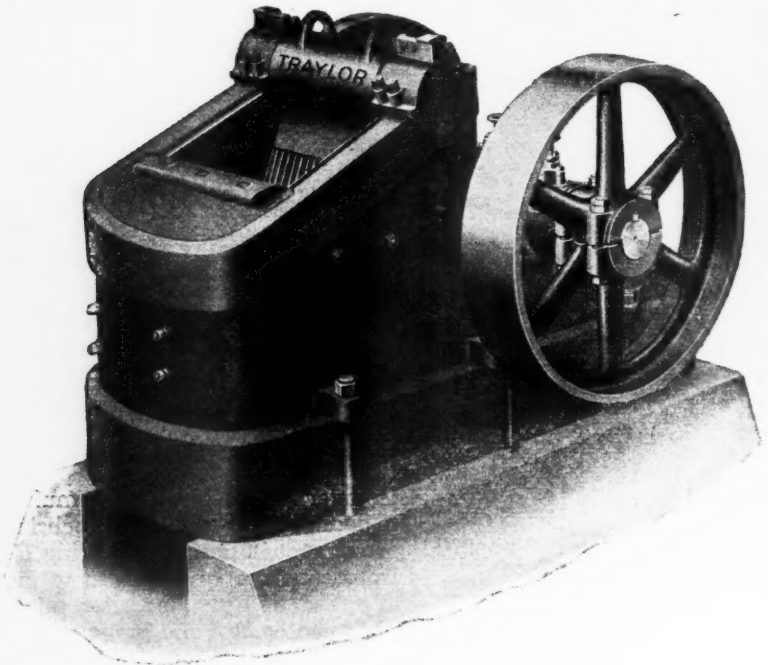
Canada, Koehring Company of Canada, Limited, 105 Front St., East, Toronto, Ontario

Mexico, F. S. Lapum, Cinco De Mayo 21, Mexico, D. F.

A 2785-III-IV

# TRAYLOR

## BULL DOG JAW CRUSHER



**Economical**

**Accessible**

**Sturdy**

SEND FOR BULLETIN 1099

**Traylor Engineering and Manufacturing Company**  
ALLENTOWN, PENNA.

NEW YORK  
30 Church St.

CHICAGO  
1414 Fisher Bldg.

LOS ANGELES  
I. W. Hellman Bldg.

SEATTLE  
815 Alaska Bldg.

SALT LAKE CITY, 100 W. 2nd South St.

Export Department, 60 Water St., New York City—Cable Address: "Forsaltra"

International Machy. Co., Santiago, Chile.

International Machy. Co., Rio de Janeiro, Brazil.

Fraser & Chalmers (S. A.), Ltd., Johannesburg, S. A.

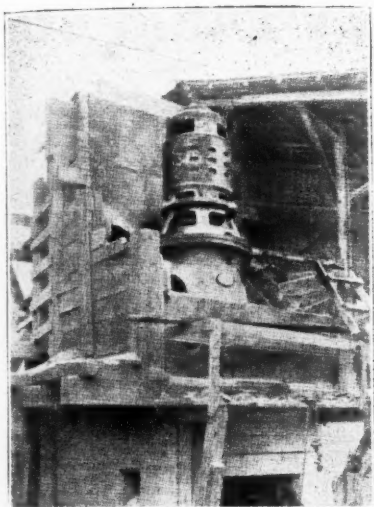
General Electric (S. A.), Buenos Aires.

W. R. Grace & Co., Lima, Peru.

British & Foreign Machy. Co., London

S. Oppenheim & Co., Ltd., Rangoon, India

*European Works: Ghent, Belgium, Usines Carels Freres.*



## The practical thing to do—

*Ask the man who has  
tested the Weston Crusher*

Ask some operators who have given a Weston Crusher a thorough test at their own plants, and you will get reports like this one—

“The Weston Crusher we installed has been entirely satisfactory and has more than fulfilled the claims made for it. We have had no repairs or adjustments other than replacing concaves and mantle. We know the Weston requires very little power.”

It is these operators who are operating Weston Crushers that can give you facts from their own experience, showing how these machines are saving money by greater capacity, lower operating costs and great durability.

We shall be very glad to give you details of some reports by Weston Crusher users and put you in touch with other operators. Write today.

**THE MORGAN ENGINEERING COMPANY**  
ALLIANCE, OHIO

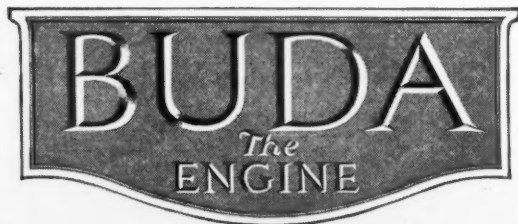


**DIRECT DRIVE GYRATORY CRUSHER**

**B**EHIND every Buda engine there are 44 years of successful engineering experience. Something the owner doesn't pay for, but something that pays the owner—in extra service, low cost of operation, exceptional performance.

THE BUDA COMPANY, HARVEY CHICAGO ILLINOIS  
ESTABLISHED 1881 SUBURB

*Buy only genuine Buda Parts for your Buda engine*







A "MASSILLON" in the pit of Massillon Washed Gravel Co., Massillon, O.

**THE MASSILLON WASHED GRAVEL CO.**  
 MASSILLON, OHIO

DIRECTORS  
 W. R. RUSSELL  
 J. H. BROWN  
 J. W. BROWN  
 J. W. BROWN  
 J. W. BROWN

September 9<sup>th</sup>, 1925.

The Russell & Company,  
 Massillon, Ohio.

Gentlemen:-

The "MASSILLON" Shovel which we purchased from your company in February 1925, has delivered excellent service and has proven its merit under most trying digging conditions. We are particularly pleased with the power and speed of the machine and have found the construction to be sound.

You are maintaining your old name for reliable goods.

Yours truly,  
*The Massillon Washed Gravel Co.*  
 E. J. Kay, Pres.

**Service—  
 Every  
 Day  
 All  
 Day**

**THE RUSSELL & COMPANY**  
 BUILDERS MASSILLON, OHIO

**The MODERN  MASSILLON**  
 Steam — **3/4-7/8** — Shovel  
 RANGE

# Get the facts today about Brookville haulage cost savings

In any quarry, sand pit, road building or industrial service where a three or four ton locomotive is suitable, the locomotive investment will be definitely less and operation costs and maintenance less, if Brookville Gasoline Locomotives are employed.

Don't take our word for this but investigate and find out for yourself. The facts are easily obtainable. And it is to your interest to get them. If haulage enters into your production cost you can cut this item by using **BROOKVILLE HAULAGE.**

*We'll help to investigate by giving you prices, by referring you to users who can speak from experience, by service of our engineering department. Write today.*

Brookville Truck & Tractor Co.  
Brookville, Pa.

## ***BROOKVILLE***

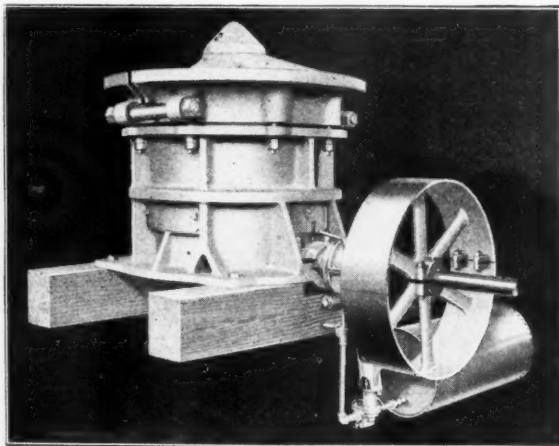
CASOLINE LOCOMOTIVES



## TELSMITH began by being **DIFFERENT**

Gyratory crushers, invented in the early eighties, had seen but one development until Telsmith "pillar shaft" crusher appeared in 1906. Telsmith was a vast improvement over the old "lever shaft" type. Four different Telsmith models have since appeared, each a progressive step in crusher design.

Even greater efficiency has resulted from the present Telsmith, brought out in 1923. Its improvements are as far reaching in effect as was the original pillar shaft invention. Consider them carefully: steel frame and crown, guaranteed against breakage by tramp iron; simplified adjustment; perfectly controlled lubrication through hollow shaft, reducing oil required to a minimum; eccentric bearings vastly improved, consumption of babbit greatly reduced; radical changes in crushing head eliminating jack screws, flanged headliner and two wearing surfaces.



Telsmith began by being different. Time was to tell if that difference meant increased efficiency and permanent superiority. It has told—Telsmith's leadership grows with the years.

Telsmith's features are interestingly presented in our Catalog No. 161 (Telsmith Primary Breaker) and Bulletin No. 2F15 (Telsmith Reduction Crusher). We'll mail it gladly.

# TELSMITH

SMITH ENGINEERING WORKS, 88 Lake Boulevard, Milwaukee, Wisconsin

Canadian Representative, Canadian Ingersoll-Rand Co., Montreal, P. Q.

18 East 41st St.  
New York City  
Beckwith Mch. Co.  
Pittsburgh and Cleveland  
Borchert-Ingersoll, Inc.  
St. Paul, Minn.

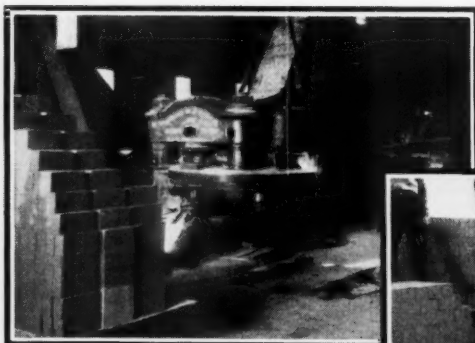
Old Colony Bldg.  
Chicago, Ill.  
Selbert-Milburn Co.  
Columbus, Ohio  
Geo. F. Smith Co.  
St. Louis, Mo.

Waldo Bros. & Bond Co.  
Boston, Mass.  
Knox Eq. & Eng. Co.  
Indianapolis, Ind.  
Bunting Hdwy. & Mch. Co.  
Kansas City, Mo.

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*Bricks Made Today—  
Laid in the Wall  
Tomorrow!*



**TODAY**



**TOMORROW**

These cuts show The Walker & Frank Plant, 8810 Dix Avenue, Detroit, equipped with "American" Sand-Lime Brick machinery.

We build a complete line of machinery for modern Sand Lime Brick Plants including Presses, Mixers, Proportioning and Grinding Machines, Hardening Cylinders, Transfer Cars, Turn Tables, etc. We equip any desired capacity.

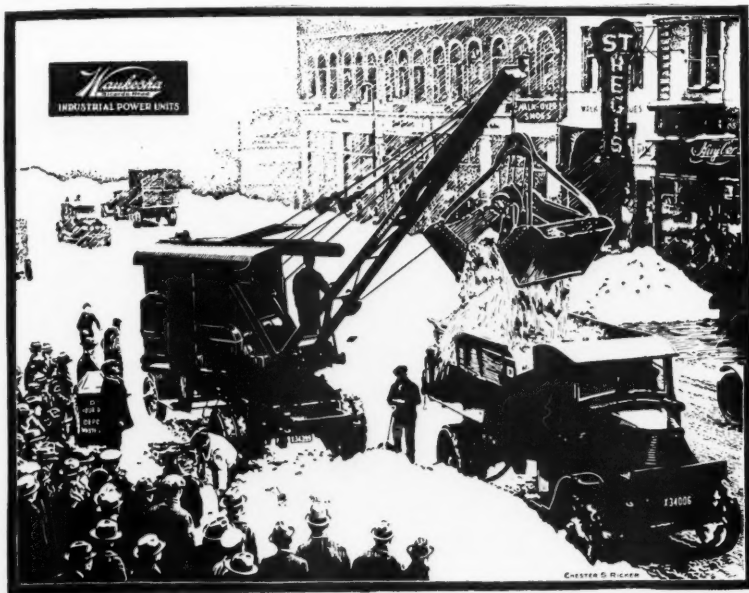
Good sharp sand and lime are the only material required.

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**The Hadfield-Penfield Steel Company**  
BUCYRUS OHIO

*One of Nine Waukesha Engined Universal Cranes used by the City of New York.*



**CLEANING UP  
BROADWAY  
with a  
WAUKESHA  
MOTOR**

When the thermometer stands at zero on Broadway—Bellingham, or Butte or anywhere else—Waukesha powered Industrial equipment always is 100% OPERATABLE and EFFICIENT. These nine Waukesha engined Universal Cranes cleaned up Broadway throughout all of the coldest weather last winter.

*Thirty-two Different Industries use these Waukesha Engines in sizes from 15 to 100 H. P. Write for "Waukesha Industrial Bulletin" which illustrates many interesting applications.*

**WAUKESHA MOTOR COMPANY**  
Waukesha, Wisconsin

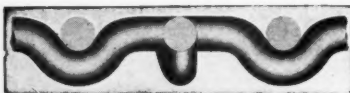
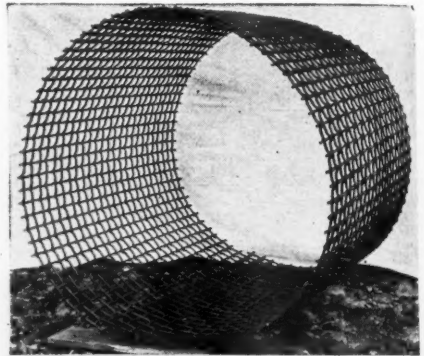
New York      Kansas City      Denver      Tulsa      Houston  
Aeolian Building      V. L. Phillips Co.      Wilson Machy. Co.      C. F. Camp Co.      Portable Rotary Rig Co.

*Exclusive Builders of Heavy Duty Gasoline Engines for Nearly Twenty Years*

# It's Easy— To Understand Why

ROL-MAN Woven Manganese Steel Screens with the Double Lock Mesh increase production and wear longest, giving a cleaner, more uniform product. Being lighter than perforated plate they require less power to operate. Their high abrasive resistance increases with wear under the heaviest duty.

A trial installation results in the permanent adoption of ROL-MAN Woven Manganese Steel Screens. They are made in all sizes and shapes and are used in some of the largest plants.



CROSS SECTIONAL VIEW OF MESH

THE WEARING  
SIDE HAS A  
SMOOTH FLAT  
SURFACE

## Manganese Steel Forge Co.

Manufacturers of ROL-MAN

Manganese Products

TRADE



MARK

RICHMOND & ERIE AVE.

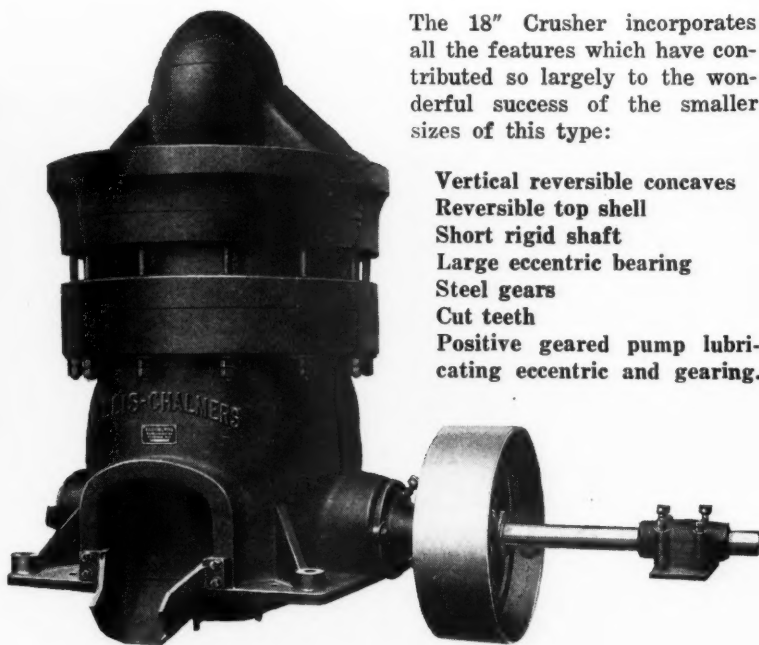
PHILADELPHIA, PA.

## New 18 Inch Superior McCully Fine Reduction Gyratory Crusher

The latest development in the Superior McCully Fine Reduction line, furnished to a large Cement Company—Having two feed openings each 18" by 68"—Capable of taking the product from the largest size primary crushers—Capacity with minimum discharge opening of 2½"—225 to 275 tons per hour.

The 18" Crusher incorporates all the features which have contributed so largely to the wonderful success of the smaller sizes of this type:

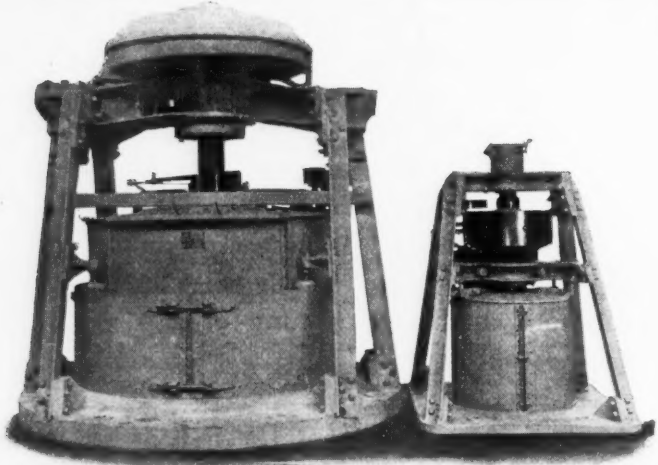
- Vertical reversible concaves
- Reversible top shell
- Short rigid shaft
- Large eccentric bearing
- Steel gears
- Cut teeth
- Positive geared pump lubricating eccentric and gearing.



# ALLIS-CHALMERS

MILWAUKEE, WIS. U. S. A.

# PULVERIZERS



Bradley Hercules Mill

No. 24 Griffin Mill

## Pulverizing Machinery For Most Every Purpose—

For Cement Plants—Fertilizer Plants—  
Agricultural Limestone Plants, Etc.—Etc.

### *Reducing*

Cement Clinker—Cement Rock—Limestone—  
Phosphate Rock—Agricultural Limestone—Rock  
Dust for Mines—Gypsum—Etc., Etc.

**Out Puts—1-40 Tons per Hour**  
**Fineness—20-200 Mesh**

**BRADLEY PULVERIZER COMPANY**

BOSTON Works: ALLENTOWN, PA. LONDON



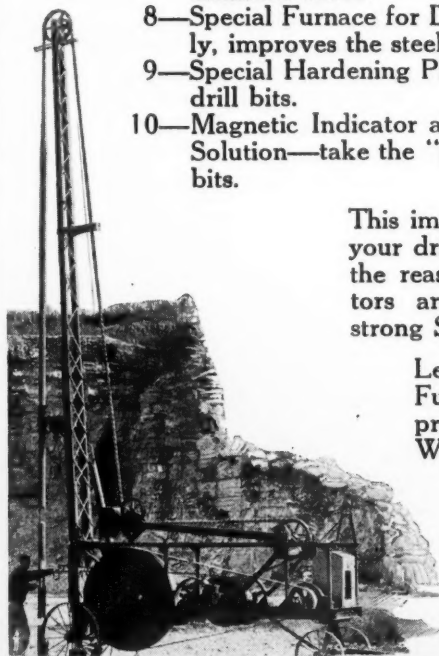
## *Announcing* The Armstrong System of Blast Hole Drilling

**T**HE Armstrong System of Blast Hole Drilling embodies ten new, exclusive and important features which cannot be found in any other blast hole equipment!

- 1—All Steel Construction—unbreakable, fire-proof.
- 2—Wire Line Derrick—cuts cable costs 75%.
- 3—Clutch Controlling Drilling Motion—guaranteed for life.
- 4—Gasoline Engine Power—even, dependable power plus.
- 5—New Drilling Motion—more blows per minute.
- 6—Patented Drill Bits—cut faster, eliminate fishing jobs.
- 7—Patented Bit Dresser—easily operated by unskilled labor.
- 8—Special Furnace for Drill Bits—heats properly, improves the steel.
- 9—Special Hardening Process—increases life of drill bits.
- 10—Magnetic Indicator and Improved Chemical Solution—take the “guess” out of hardening bits.

This improved method reduces your drilling costs and explains the reason why the big operators are installing the Armstrong System.

Let us tell you more about it. Full details, specifications and proof of performance sent free. Write us NOW—today—sure.



**Armstrong  
Manufacturing Company**  
103 Chestnut St.  
WATERLOO, IOWA, U. S. A.

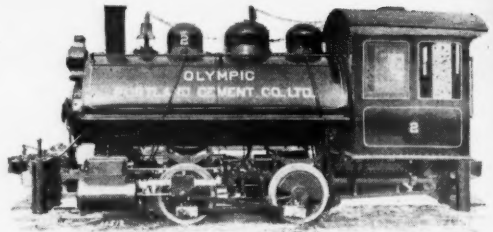
Ask any of  
these users—  
*they know!*

**Olympic  
Portland  
Cement  
Company**

Alpha P. C. Co.....(2)  
Asano Cement Co.....(1)  
Atlas P. C. Co.....(1)  
Acme Cement Co.....(1)  
Bonner Brand P. C. Co.(1)  
Castalia P. C. Co.....(2)  
Canadian P. C. Co.....(2)  
Cuban P. C. Co.....(3)  
Coplay Cement Co.....(2)  
Dewey P. C. Co.....(3)  
Edison P. C. Co.....(3)  
Fort Dodge P. C. Co.....(2)  
Glens Falls P. C. Co.....(2)  
Giant P. C. Co.....(5)  
Hercules Cement Corp..(1)  
Hermitage P. C. Co....(1)  
Iowa P. C. Co.....(1)  
International P. C. Co..(3)  
Indiana P. C. Co.....(2)  
Kansas P. C. Co.....(2)  
Kentucky P. C. Co.....(1)  
Lehigh P. C. Co.....(12)  
Louisville Cement Co..(2)

### Vulcan Products

Hoists,  
Electric and Steam  
Locomotives,  
Steam, Gasoline, Electric  
Rotary Kilns, Dryers, Coolers and  
Roasters  
Fairchild Double-Discharge  
Ball Mill  
Mine Ventilating Fans  
Cages and Ships  
Sheave Wheels  
Corliss Engines  
Coal Crushers  
Gray Iron Castings  
Open Hearth Steel Castings  
Gears, Moulded and Cut Teeth  
Special Machinery



## Vulcan Locomotives at the Olympic Plant!

Vulcan Steam Locomotives at the Olympic Portland Cement Company's Plant, Bellingham, Wash., have a real story of long-enduring service to tell. The first of these—a 40-ton Engine, 14 by 20-inch cylinders—was as good for work as when new, after 11 years' hauling. So, in 1923, when the second "loco" was needed, of course a Vulcan was selected. The second is a 21-ton, with 11x16-inch cylinders.

There's no questioning the fact that Vulcan Locomotives stand the gaff. Ask any user listed in the panel on this page. And ask, too, about Vulcan efficiency of operation and performance. Shall we send a copy of the Vulcan Bulletin?

### VULCAN IRON WORKS

Wilkes-Barre, Pa.

Established 1849

New York Office:  
50 Church St.

Chicago Office:  
McCormick Bldg.

**VULCAN** of  
**WILKES-BARRE**  
**LOCOMOTIVES**



## Half a Cent a Ton for Hauling

One user of Whitcomb Locomotives hauls cars of coal for \$.00586 per ton, that figure including fuel and labor costs, two men being employed—one operator for the Locomotive, one man for coupling cars, etc.

Accurate costs kept on haulage work proves "Whitcomb's" the most economical haulage tools.

They are built right, of the best materials and amply powered, 10 to 16 Horse Power per ton of weight being allowed. Experience has proved that ample power is essential in industrial locomotives and "Whitcomb's have more Horse Power per ton."

Have you a copy of our bulletin covering the size and kind of locomotive you need for your work—where shall we send it?

**Geo. D. Whitcomb Company**

Rochelle

Illinois

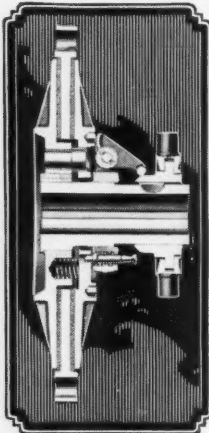
*Offices in principal cities*

GASOLINE - STORAGE BATTERY - ELECTRIC  
**WHITCOMB**  
 LOCOMOTIVES



# TWIN DISC

## CLUTCHES



**T**HE lowest work factor tolerated in a Twin Disc installation is twice the capacity of the motive power.

This margin insures the faithful performance of the clutch in any emergency. It enables the machine to turn out the volume of work for which it is designed. It provides a greater degree of clutch flexibility, thus doing away with life-shortening shocks and strains on engine and working parts.

Consult with our Engineering Department.

## TWIN DISC CLUTCH COMPANY

RACINE

WISCONSIN

### REPAIR SERVICE STATIONS

E. George & Co., Broome and Wooster Sts., N. Y. City.  
 James R. Howell, 6715 Quimby Avenue, Cleveland  
 Coast Machinery Corp., Los Angeles  
 F. Somers Peterson Co., San Francisco  
 Nash Motor Sales Co., Raleigh, N. C.  
 Motive Parts Co. of America, Inc.,  
 Chicago, Cincinnati, Des Moines, Indianapolis

## Austin Super Crushers

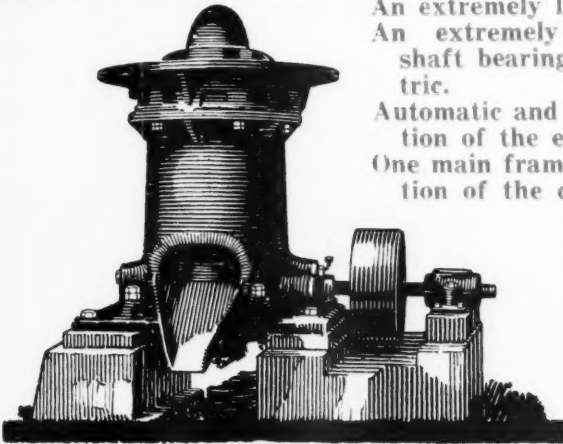
These Crushers are built especially for crushing extremely hard rock and gravel to small sizes. They are approximately the same size as the Standard No. 3, 4 and 5 Austin Gyratories. All proven improvements were incorporated in the design of the Super Crushers, and among their distinguishing characteristics are the following:

An extremely large eccentric.

An extremely large lower shaft bearing in the eccentric.

Automatic and ample lubrication of the eccentric.

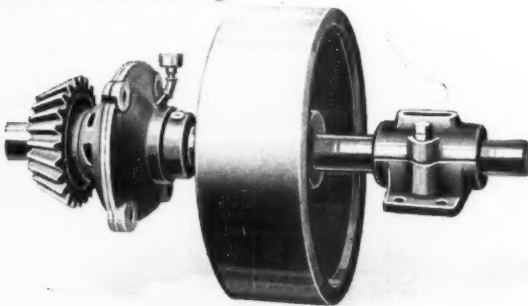
One main frame for any position of the countershaft.



The countershaft has a bearing on each side of the pinion as in the Standard Crusher. The countershaft bearings are removable, and both inside and outside bearings

run in removable bronze bushings. The picture at the bottom of the page shows the assembled countershaft which fits into the main frame. The outside bearing makes a dust and oil proof cover for one of the oil cellar openings, while the other two openings are also made dust and oil proof by machined casting covers.

The lubrication of the eccentric is very effective. The pinion, running in oil, picks up the oil and throws it on the under side of the sloping diaphragm from which it flows into a trough above and completely surrounding the eccentric. This trough contains a series of evenly spaced holes through which the oil flows, lubricating the inside and outside of the eccentric. The overflow lubricates the inside countershaft bearing.



Super Crushers are all that the name implies. We would like to tell you more about the service and satisfaction that one of them will give you.

**AUSTIN MANUFACTURING CO.**  
400 N. MICHIGAN AVE., CHICAGO

## WHEN BLASTING AGAINST TIME *the New Type "Clipper" Blast Hole Drill Don't Fail You*



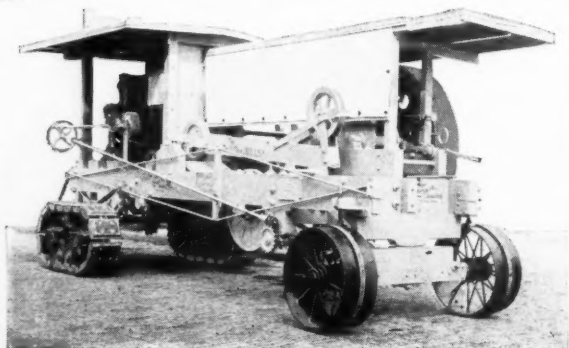
*View of a portion of one of several quarries, owned by one company, where a number of "CLIPPERS" have made possible big reduction in the price of the output of stone.*

Fighting the time element in blast hole drilling bites chunks from profits. Greater speed means greater savings on production costs. "CLIPPER" Drills, for years the speediest Drills in hundreds of quarries, defeat the time element. But that's not all. The "CLIPPER" cuts power consumption—cuts repair bills—cuts labor costs—some of the reasons it predominates in the blast hole field.

Whether it's operating under steam, electric, compressed air or gasoline power, a "CLIPPER" Blast Hole Drill shows its superiority with actual results. Improved features of "CLIPPER" Drills will interest you.

The little time required to send for further information will amply repay you.

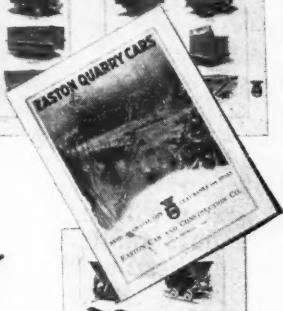
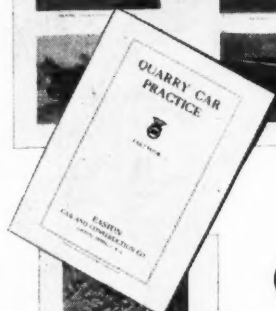
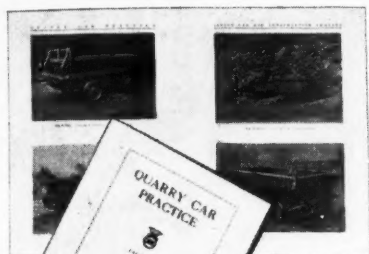
*Showing Spudding Beam side of the new type Gasoline Power "CLIPPER" Blast Hole Drill, equipped with crawler rear wheels.*



**THE LOOMIS MACHINE CO.**  
15 MARKET ST.

**TIFFIN, OHIO**

# EASTON QUARRY CARS



PART  
SIX

## QUARRY CAR PRACTICE

*Sent on Request*

**N**O quarryman should let chance or initial cost determine his selection of a quarry car.

This bulletin, "Quarry Car Practice," contains many pictures of all makes of cars under actual working conditions.

Easton is justly proud of the part it has taken in producing and creating a demand for better quarry cars.

You will find that your problem is not new to us.

*Let Us Help You Solve It*

**EASTON CAR & CONSTRUCTION CO.**

Kansas City, Mo., and Easton, Pa.

New York Chicago Pittsburgh Philadelphia San Francisco

# EASTON CARS

FOR EVERY PIT MINE & QUARRY

# THE CRUSHERS

*with the*  
**Troubles Left Out**

## WHY THEY LEAD

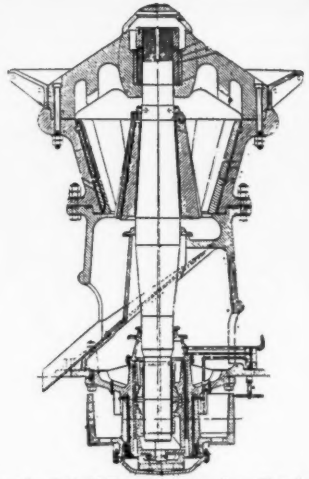
- 1—They are noiseless and run like watches.
- 2—50% greater capacity for same power.
- 3—Practically no wear on anything but head and concaves.
- 4—Short shaft and saving in head room with packed dust collars.
- 5—Shaft reinforced with self-locking head so that it cannot break where 90% of shafts have broken.
- 6—Can be driven right, left, or standard, as sent from shop.
- 7—Eccentric is turned by flexible coupling attached to pulley, which prevents side thrust and heating, as in geared crushers.
- 8—Ball and socket eccentric, self-aligning, eliminating friction and heating. Runs for years without attention.
- 9—Positive circulating oil system through filter and cut geared oil pump.
- 10—Made in our own shop by experts, trained for the job.
- 11—It is a crusher with the trouble left out. See it in operation, and you are unfit to listen to any geared crusher salesman. In fact, if you are near one of his machines, you can't hear him, if you are so inclined.
- 12—Our fine crusher does the work of 4 geared crushers.

*Send for catalogue and tell us what your problems are, and one of our experts will call on you without obligation on your part.*

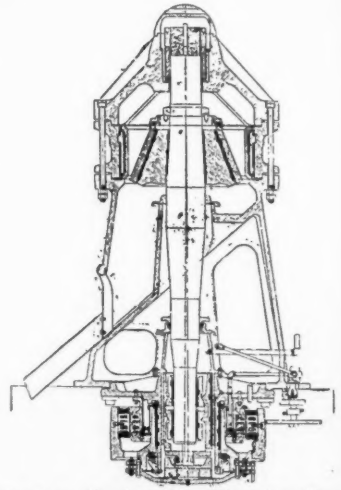
**KENNEDY VAN SAUN MFG. & ENGR. CORP.**  
50 Church St. NEW YORK

Kearns Bldg., Salt Lake City, Utah  
414 So. Spring St., Los Angeles, Calif.  
Annex Hotel, St. Louis, Mo.

1739 Roanoke Bldg., Chicago, Ill.  
73 Cullinan Bldg., Johannesburg, So. Africa  
40, Rue des Mathurins, Paris, France



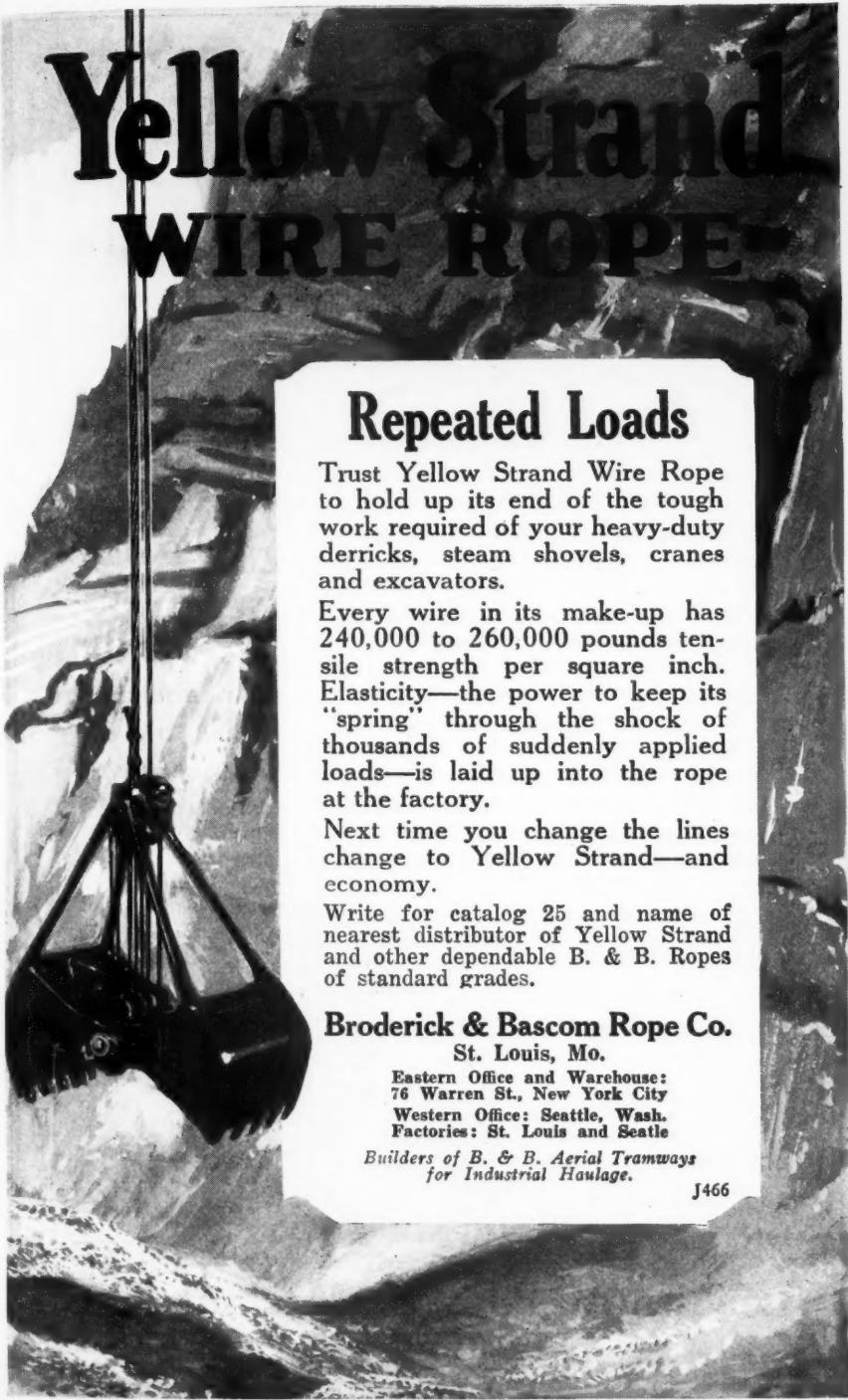
Standard Ball Bearing Gearless Crusher.  
Sizes No. 1 to No. 60—Weights 1,000  
to 900,000 lbs.



Gearless Crusher for Fine Crushing.  
Do not be deceived by Vertical Con-  
caves; that is not what makes a fine  
crusher.



# Yellow Strand WIRE ROPE



## Repeated Loads

Trust Yellow Strand Wire Rope to hold up its end of the tough work required of your heavy-duty derricks, steam shovels, cranes and excavators.

Every wire in its make-up has 240,000 to 260,000 pounds tensile strength per square inch. Elasticity—the power to keep its “spring” through the shock of thousands of suddenly applied loads—is laid up into the rope at the factory.

Next time you change the lines change to Yellow Strand—and economy.

Write for catalog 25 and name of nearest distributor of Yellow Strand and other dependable B. & B. Ropes of standard grades.

### Broderick & Bascom Rope Co.

St. Louis, Mo.

Eastern Office and Warehouse:

76 Warren St., New York City

Western Office: Seattle, Wash.

Factories: St. Louis and Seattle

*Builders of B. & B. Aerial Tramways  
for Industrial Haulage.*

J466



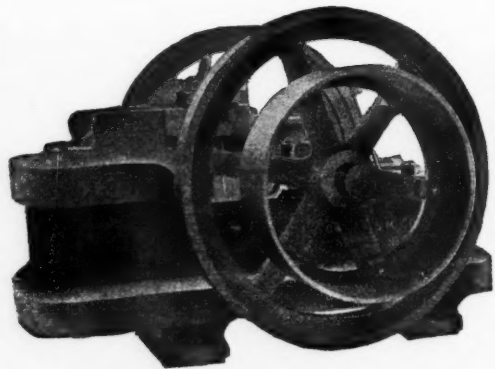
Lewistown Sand Washers—  
highly recommended  
for the preparation of  
GLASS SAND

## IS YOUR PROBLEM LISTED HERE ?

We are in position to help you meet your problem in a speedy, satisfactory manner, if it pertains to crushing, grinding, screening, washing, drying or conveying, for we manufacture a full line of this equipment for pit and quarry service.

These are reasonably priced, well built, compact outfits—efficient and quickly installed.

Will you drop us a line, stating what equipment you desire information on?



**Lewistown Fdy. & Machine Co.**  
LEWISTOWN, PENN.



## When Emergency Demands Fast Delivery

NOT alone is Grasselli satisfied with supplying you fresh explosives of highest quality but they must be quickly available for any emergency.

No matter where your quarry may be located, there's a Grasselli mill or magazine close to you, with shipping facilities that mean quick deliveries when you want them. At every Grasselli distributing station is carried a complete stock of all grades of Grasselli Explosives and accessories ready for immediate shipment when you want them.

When you buy Grasselli Explosive you are not only assured of their excellent quality—but of quick service as well.

### THE GRASSELLI POWDER COMPANY

Main Office: Cleveland, Ohio

Branches:

Philadelphia  
Bluefield, W. Va.  
Birmingham  
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Chicago  
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Pottsville, Pa.  
Hazleton, Pa.  
New Castle, Pa.

The Grasselli Powder Co., of Florida, Miami, Fla.

# GRASSELLI EXPLOSIVES

## *Heil Bodies Tapered in Width*



These Autocar trucks are equipped with Heil steel dump bodies 10' 6" long, 6' 6" tapered in width, 27" high. No. 5 Heil Hydro Hoists are installed on the entire fleet.

## **Baker's Fleet Is Heil-Equipped**

**H**ERE are twenty-five Heil-equipped trucks in the service of J. K. Baker, Philadelphia. These trucks have just completed hauling material for the new Absecon Blvd. leading into Atlantic City.

On the big road and excavating contracts where speed and efficiency are wanted, you need dump trucks equipped with the hoist that never fails—a Heil Hydro Hoist. There is a Heil Hoist model for every motor truck. Pit and Quarry operators will find the unit they want described in the new 1926 Heil Catalog.

**Note:** The Heil Co. has equipped the largest dump truck fleets in America during 1925. Let us send you an illustrated folder, Bulletin 152, giving detailed information about these installations.

### **THE HEIL CO.**

1139-75 Montana Ave., Milwaukee, Wis.

Factory branches and warehouses in Chicago and Philadelphia. One of our thirty-five distributors is near you.

## **HEIL QUALITY 25<sup>th</sup> ANNIVERSARY**

# Free Service to our readers

For the convenience of readers who are in the market for equipment, our "Free Service" department will furnish on request any information, catalogs and prices on any machinery, equipment or supplies used in pits and quarries. The coupon below makes it easy for you. Simply check, sign and mail.

## Pit & Quarry, Rand McNally Bldg., Chicago, Ill.

Pit and Quarry, Research Department,  
Rand McNally Bldg., Chicago, Ill.

WE ARE IN THE MARKET for the items checked below, and would be glad to receive catalogs, prices or other information.

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| <input type="checkbox"/> Air Compressors                         | <input type="checkbox"/> Cars, End Dump<br>(Gauge .....in.)    | <input type="checkbox"/> Dredges, Land                                            |
| <input type="checkbox"/> Air Compressors,<br>Portable            | <input type="checkbox"/> Cars, Side Dump<br>(Gauge .....in.)   | <input type="checkbox"/> Dredges, Sand<br>Suction                                 |
| <input type="checkbox"/> Babbitt Metal                           | <input type="checkbox"/> Cars, Steel Gondola                   | <input type="checkbox"/> Drill Steel                                              |
| <input type="checkbox"/> Baffles                                 | <input type="checkbox"/> Castings, Special<br>Metal            | <input type="checkbox"/> Drilling Contractors                                     |
| <input type="checkbox"/> Bag Filling Machines                    | <input type="checkbox"/> Chain Drive                           | <input type="checkbox"/> Drill Sharpening<br>Machines                             |
| <input type="checkbox"/> Bag Sewing Mach.                        | <input type="checkbox"/> Chain, Conveyor                       | <input type="checkbox"/> Drills, Blast Hole                                       |
| <input type="checkbox"/> Bags, Cotton                            | <input type="checkbox"/> Chain, Steam Shovel<br>and Dredge     | <input type="checkbox"/> Drills, Hand Hammer                                      |
| <input type="checkbox"/> Bags, Paper                             | <input type="checkbox"/> Chaser Mills                          | <input type="checkbox"/> Drills, Tripod                                           |
| <input type="checkbox"/> Ball Mills                              | <input type="checkbox"/> Chutes and Liners,<br>Metal           | <input type="checkbox"/> Dryers, Sand and<br>Stone                                |
| <input type="checkbox"/> Barges                                  | <input type="checkbox"/> Classifiers                           | <input type="checkbox"/> Dry Pans                                                 |
| <input type="checkbox"/> Barrels, Steel                          | <input type="checkbox"/> Clips, Wire Rope                      | <input type="checkbox"/> Dump Wagons                                              |
| <input type="checkbox"/> Belt Fasteners                          | <input type="checkbox"/> Clutches                              | <input type="checkbox"/> Dust Collecting<br>Systems                               |
| <input type="checkbox"/> Belting, Conveyor                       | <input type="checkbox"/> Controllers, Electric                 | <input type="checkbox"/> Dynamite                                                 |
| <input type="checkbox"/> Belting, Transmission                   | <input type="checkbox"/> Conveyor Equipment                    | <input type="checkbox"/> Dynamos, Electric                                        |
| <input type="checkbox"/> Bin Gates                               | <input type="checkbox"/> Conveyor Rollers                      | <input type="checkbox"/> Economizers, Fuel                                        |
| <input type="checkbox"/> Bins, Clay Tile Storage                 | <input type="checkbox"/> Couplings, Flexible                   | <input type="checkbox"/> Elevating Equipment                                      |
| <input type="checkbox"/> Bins, Concrete Storage                  | <input type="checkbox"/> Cranes, Electric<br>Traveling         | <input type="checkbox"/> Engineering Service                                      |
| <input type="checkbox"/> Bins, Steel Storage                     | <input type="checkbox"/> Cranes, Jib                           | <input type="checkbox"/> Engines, Gasoline<br>(H. P. ....)                        |
| <input type="checkbox"/> Blasting Fuses                          | <input type="checkbox"/> Cranes, Locomotive                    | <input type="checkbox"/> Engines, Gasoline<br>Portable Power Unit<br>(H. P. ....) |
| <input type="checkbox"/> Blasting Powder                         | <input type="checkbox"/> Cranes, Traction                      | <input type="checkbox"/> Engines, Hoisting                                        |
| <input type="checkbox"/> Bodies, Steel Dumps<br>for Motor Trucks | <input type="checkbox"/> Crusher Parts                         | <input type="checkbox"/> Engines, Hydraulic<br>Pumping                            |
| <input type="checkbox"/> Boiler Compound                         | <input type="checkbox"/> Crushers, Disc                        | <input type="checkbox"/> Engines, Oil<br>(H. P. ....)                             |
| <input type="checkbox"/> Boiler Skimmers                         | <input type="checkbox"/> Crushers, Gyratory                    | <input type="checkbox"/> Engines, Power Plant                                     |
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| <input type="checkbox"/> Buckets, Grab                           | <input type="checkbox"/> Crushers, Roll                        | <input type="checkbox"/> Fire Alarms                                              |
| <input type="checkbox"/> Buildings, Portable                     | <input type="checkbox"/> Derrick Swingers                      | <input type="checkbox"/> Fire Alarm Systems                                       |
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| <input type="checkbox"/> Car Pullers                             | <input type="checkbox"/> Dragline, Scraper                     |                                                                                   |
| <input type="checkbox"/> Car Replacers                           |                                                                |                                                                                   |
| <input type="checkbox"/> Car Wheels                              |                                                                |                                                                                   |

(Continued on next page)

To be used for .....

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Address .....

City ..... State .....

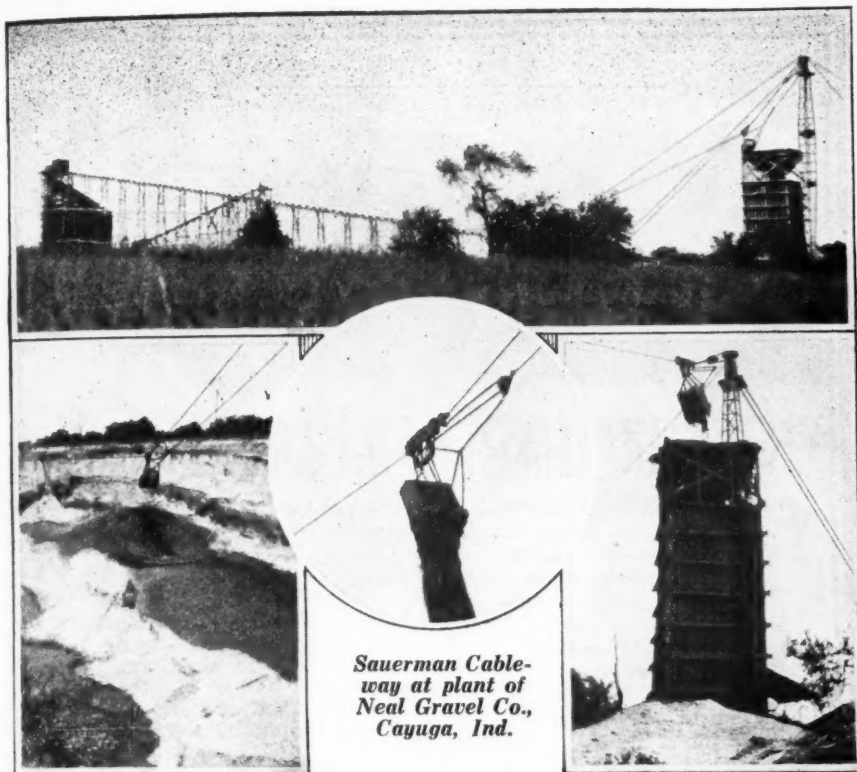
- Gears
- Generators, Electric
- Governors
- Grapple, Stone
- Grate Bars
- Grates
- Gypsum Separators
- Hoisting Engines
- Hoists, Chain
- Hoists, Derrick
- Hoists, Drum
- Hoists, Hydraulic, Motor Truck
- Hoists, Hand, Motor Truck
- Hose, Sand Suction
- Hydrators
- Hydraulic Mining Nozzles
- Hydraulic Pipe
- Hydraulic Pumping Engines
- Hydraulic Valves (Pulpit and Indicator)
- Idlers, Belt Conveyor
- Industrial Railway Systems
- Kettles
- Kilns, Cement
- Kilns, Lime
- Lights, Carbide
- Linings, Bag and Barrel
- Loaders, Bin, Portable
- Loaders, Boom and Bucket
- Loaders, Box Car
- Loaders, Conveyor
- Locomotives, Electric (Gauge .....in.)
- Locomotive, Gasoline (Gauge .....in.)
- Locomotives, Steam (Gauge .....in.)
- Locomotives, Storage Battery (Gauge .....in.)
- Log Washers
- Lubricators
- Magnetic Separators
- Manganese Steel
- Manganese Steel Parts
- Metal, Babbitt
- Metal, Perforated
- Meters
- Mills, Chaser
- Mills, Tube
- Motors, Electric (H. P. ....)
- Motors, Gasoline (H. P. ....)
- Motors, Gasoline Portable Power Unit (H. P. ....)
- Motor Truck Dump Bodies
- Motor Trucks
- Nozzles, Hydraulic Mining
- Nozzles, Suction Screen
- Oil Burners
- Oils and Lubricants
- Perforated Metal
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- Pipe, Hydraulic
- Pipe, Iron
- Pipe, Spiral
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- Powder, Blasting
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- Power Unit Gasoline, Portabile (H. P. ....)
- Pulverizers, Hammer
- Pulverizers, Ring
- Pulverizers, Roll
- Pump Repairs
- Pumps, Drainage
- Pumps, Dredging
- Pumps, Sand
- Pumps, Water Supply
- Pyrometers
- Rail, Steel
- Rolls, Crushing.
- Roofing and Siding (Iron, Steel, Zinc)
- Rope, Manila
- Rope, Wire
- Sand-Lime Brick Machinery
- Scales, Automatic, Conveyor
- Scales, Track
- Scrapers, Power
- Scrapers, Team
- Screening Equipment (See other side)
- Screens, Perforated Metal
- Screens, Rotary
- Screens, Vibrating
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- Stokers, Automatic
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- Stripping Equipment, Power
- Superheaters
- Swinger, Derrick
- Tachometers
- Tackle Blocks
- Tanks, Settling
- Tanks, Steel
- Tanks, Steel Welded for Air, Water and Gasoline
- Tanks, Wood
- Ties and Timbers
- Track
- Track Scales
- Track Shifters
- Tractors, Caterpillar
- Tramways, Aerial
- Transformers, Electric
- Trolley Carriers
- Trucks, Electric
- Tube Mills
- Turbines
- Unloaders, Bin
- Unloaders, Boom and Bucket
- Unloaders, Conveyor
- Wagons, Dump
- Washers, Log
- Washing Equipment
- Welding Equipment
- Winches
- Wire Cloth

To be used for.....

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*Sauerman Cableway at plant of Neal Gravel Co., Cayuga, Ind.*

## Your Excavating Costs Will Be Lower and You'll Have Less Money Tied Up in Equipment If You Use a Sauerman Slackline Cableway

**CAPACITIES: 10 TO 200 CU. YD. PER HOUR**

One of the latest improved Sauerman Slackline Cableways, operated by a Sauerman two-speed hoist, was timed for an hour at a sand and gravel plant while it was digging at a distance of 350 ft. from the plant. The bucket made 58 trips from the pit to the top of the plant during the hour, lifting a full load each time.

Another plant using a 300-ft. span Sauerman Cableway equipped with a  $3\frac{1}{2}$  cu. yd. bucket to rehandle sand and gravel from under-water storage, reports an average 10 hour capacity of 3,000 tons.

The economy of this method of excavating and conveying material to the top of a screening plant with a single machine operated by one man, is self-evident. By producing large tonnages day after day at small expense, Sauerman machines pile up handsome profits for their owners, which explains why so many sand and gravel producers who started in a

modest way a few years ago with one slackline cableway, are now operating chains of plants.

The illustrations above show a 35-car-per-day plant added this year to the chain owned by the Neal Gravel Co., Mattoon, Ill. In the days when a slackline cableway was a comparatively new type of machine, this company installed one at its first plant at Silverwood, Ind., and now in building its seventh plant at Cayuga, Ind., still favors this method of working a deep deposit of material. The new plant is equipped with an 800-ft. span, 2 cu. yd. Sauerman Slackline Cableway operated by a 150 h.p. Sauerman 2-speed electric hoist.

If you wish to have the very latest information regarding the excavating and conveying methods adopted by successful producers, send us your name and we will mail to you, free of charge, a monthly bulletin containing interesting field reports and descriptions of new plants.

**SAUERMAN BROS. Inc., 434 S. Clinton St., Chicago**  
**Manufacturers of Slackline Cableways and Power Drag Scrapers**



## When the truck hits the scale—What?

The impact of this truck on the scale—the heavy, concentrated load over the rear axle—the grinding shove caused by driving off! Here is a terrific stress on the scale members. You can't expect the ordinary wagon scale to withstand this kind of punishment. A scale sized for the job is needed.

The Fairbanks Type "S" Auto Truck Scale is built to meet these conditions exactly. Designed on the same principles as the Fairbanks heavy duty railway track scale, the Type "S" gives lifetime service, with accuracy and dependability that

will not be disturbed by the most strenuous usage.

Hundreds of Type "S" scales in use today have proved their ability to handle heaviest loads. They are speeding up weighing—standing up under the most trying conditions. One of these scales installed at your place of business will increase the good-will and confidence in your concern and will enable you to know that your truck weighing is being done on an efficient and entirely dependable basis.

The coupon brings an interesting booklet, "A Talk on Scales," including complete description and specifications.

## FAIRBANKS SCALES

New York  
Broome and Lafayette Sts.

*Preferred the*



*World Over*

Chicago  
900 S. Wabash Ave.

*And 40 other principal cities in the United States*

**FAIRBANKS SCALES, Dept. S-B-F.**

(Mail to nearest office)

Broome and Lafayette Sts., New York.

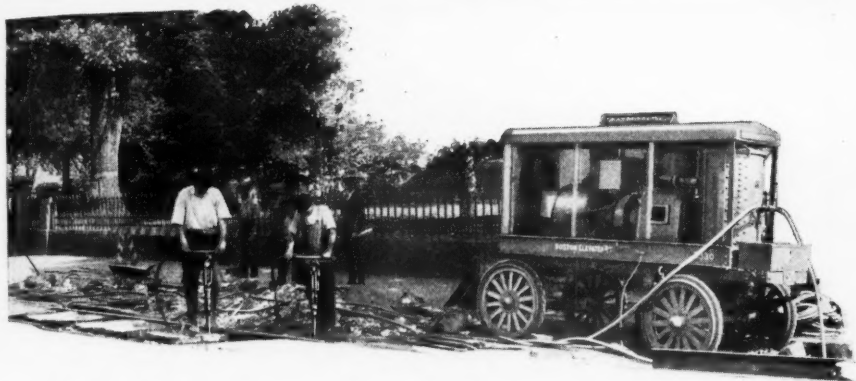
900 S. Wabash Ave., Chicago.

Please send your booklet, "A Talk on Scales," also Type "S" specifications.

Name .....

Address .....



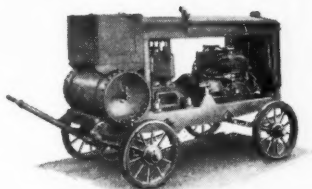


# CP Portable Compressors

WHEREVER the nature of the work calls for mobile air-power—there is a CP Portable Compressor in sizes of 100 to 300 cu. ft. to meet requirements. These dependable compressors are built in gasoline or electric motor driven types mounted upon steel or rubber-tired wheels, CP Trailers, motor trucks or skids.

All sizes of portable compressors are directly connected to the engine or motor—no gears or belts are used. With such features as Simplate Valves, automatic regulation and self-lubrication—CP Compressors insure the greatest attainable efficiency.

For valuable reference and for complete information—write for bulletins.



CP Portable Gasoline Engine Driven Compressor — mounted upon rubber-tired trailer.



Chicago Universal Hese Coupling — the most convenient coupling made. Neither half is male or female at the connection end but a combination of both. Constructed of tough bronze.

## Chicago Pneumatic Tool Company 6 East 44th Street, NEW YORK, N. Y.

*Sales and \*Service Branches all over the World*

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| Denver       | * Philadelphia | Berlin          | * Havana       | Moncton        | Seoul          |             |
| * Detroit    | * Pittsburgh   | * Bombay        | Helsingfors    | * Montevideo   |                |             |

Canadian Pneumatic Tool Company, Ltd., Montreal, manufacturers of Chicago Pneumatic products in Canada  
Consolidated Pneumatic Tool Company, Ltd., London, manufacturers of Chicago Pneumatic products in England

J-176

BOYER PNEUMATIC HAMMERS · LITTLE GIANT PNEUMATIC AND ELECTRIC TOOLS  
CHICAGO PNEUMATIC AIR COMPRESSORS · VACUUM PUMPS · PNEUMATIC HOISTS  
GIANT OIL AND GAS ENGINES · ROCK DRILLS · COAL DRILLS

# CHICAGO

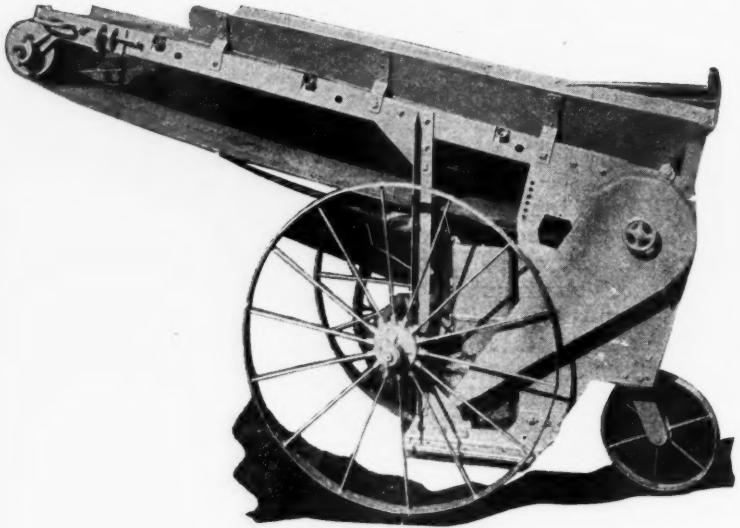
Depend Upon



# PNEUMATIC

That Name

# Load Your Cars Efficiently



## The Ottumwa Box Car Loader

Economy! Labor Saving! Added Profits! You can accomplish all these by the use of an Ottumwa Box Car Loader.

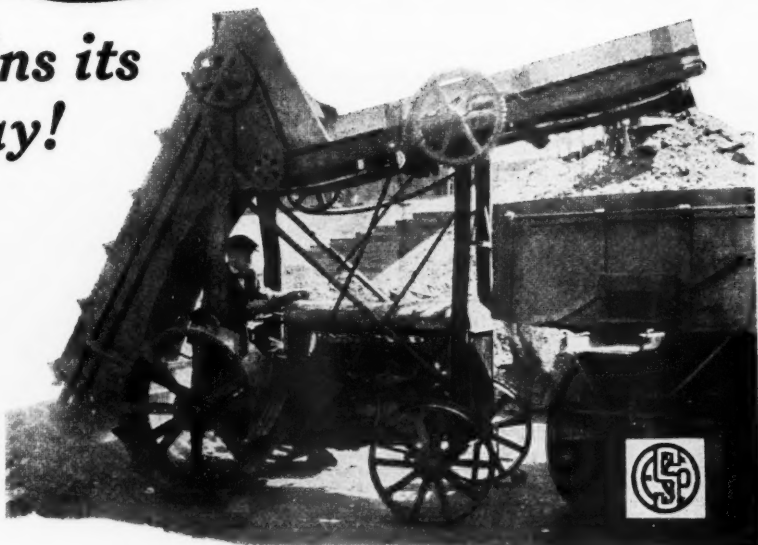
This machine is a necessary addition to the modern plant's equipment. It has been demonstrated a practical success.

*Send for full information*

**OTTUMWA BOX CAR LOADER CO.**  
**OTTUMWA, IOWA**

# *Specialty* Fordson Loader

*Wins its  
Way!*



*You Want the Best Loader Made!*

The Specialty Fordson Loader is the answer to the demand for a portable loader moving and operating under its own power. There is no more compact loader made, for this outfit has much greater power than the conventional stationary outfit, and at but slight additional cost.

The Specialty Fordson Loader crowds while the buckets are in operation, independent of reverse gear, and it can be crowded much or little at a time. The crowding mechanism is self-contained with gears running in oil. The feeders clear a path sufficient for the tractor wheels. If you want simplicity of operation and dependability, install a Specialty.

*Write for full information, mailed on request.*

## **Specialty Engineering Company**

**Allegheny & Trenton Aves.**

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# CURTIS

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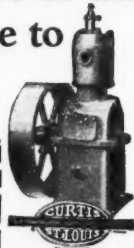
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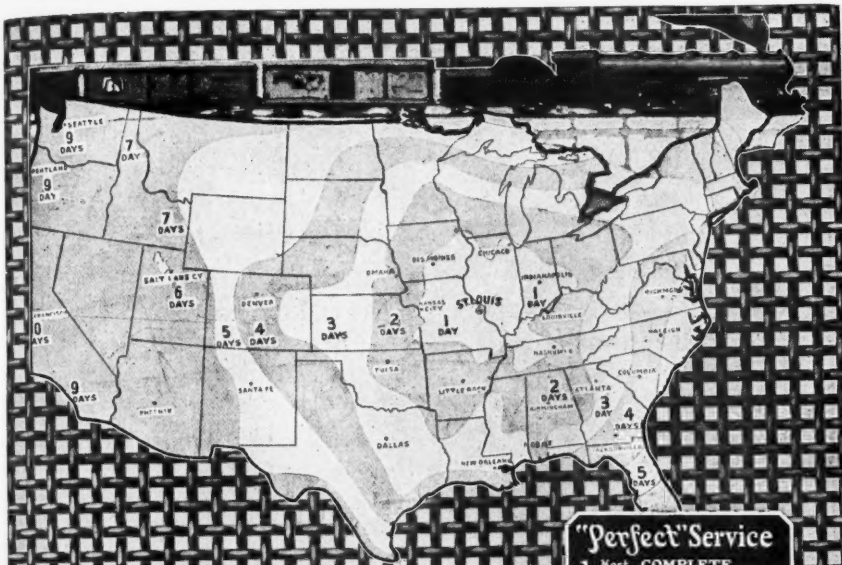
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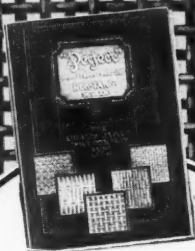
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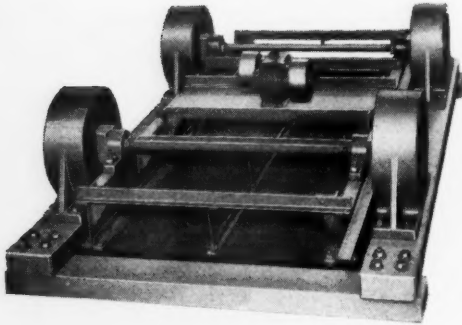
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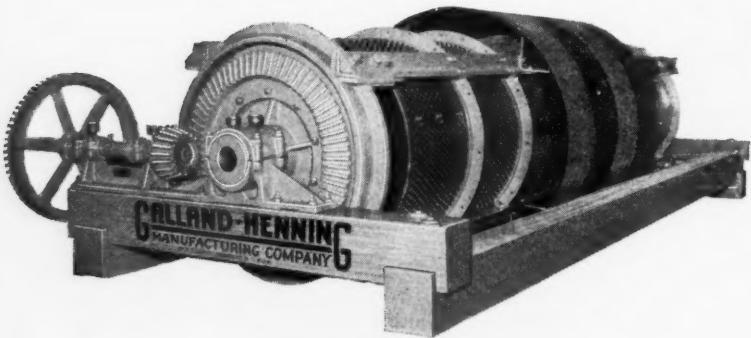
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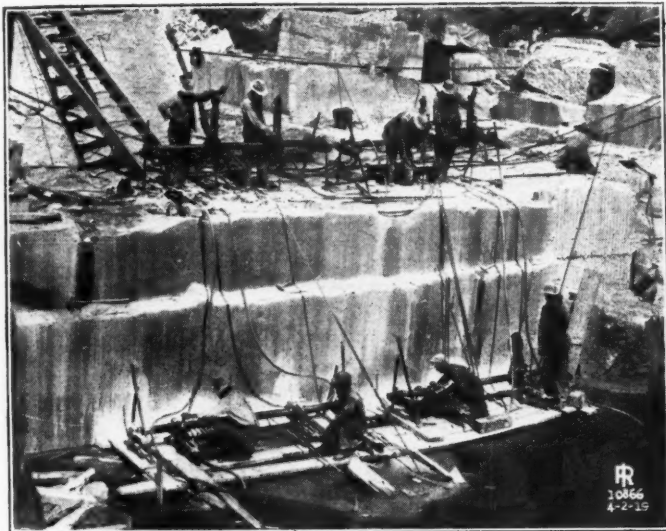
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**THE THEW SHOVEL COMPANY, LORAIN, OHIO**

# Pit and Quarry

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when you put a Brownhoist half-yard gas shovel on the job. And the reason is easily understood once you've taken time to examine one of these small outfits.

The big quiet running gears (there are only 18 in all) deliver the full power of the engine to the dipper insuring a full load at each bite. The powerful rope crowd will crowd in or out while hoisting and the steering mechanism is unmatched for actual steering results. These and many other equally worth while features will win your enthusiasm when you see this small Brownhoist shovel.

Take time to convince yourself of this machine's many advantages of construction. Our booklet, "Getting the Most Out of Your Material Handling Dollars," contains a lot of valuable information on shovels. Write for a copy.

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Branch Offices: New York, Chicago, Pittsburgh, New Orleans and San Francisco



# BROWNHOIST

**MATERIAL HANDLING MACHINERY**

# Pit and Quarry

A Semi-Monthly Publication for Producers and Manufacturers of Sand, Gravel, Stone, Cement, Gypsum, Lime and Other Non-Metallic Minerals.

Subscription price \$5.00 per year. Single copies 25c.

Vol. 11

CHICAGO, ILL., JANUARY 15, 1926

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# Automatic Aerial Tramway Did It!

Opposite is shown the lower terminal and bunker at foot of the Blue Diamond installation. The tramway installed here not only makes an otherwise inaccessible mineral deposit marketable but the tramway pull develops 35 H.P. which is used for crusher operation.



When the engineers and constructors of the Interstate Equipment Corp., can erect towers for the Blue Diamond Materials Co. under such conditions as shown opposite, they are capable of handling your problems.

*Write us now!*

**Interstate Equipment Corp.**  
25 CHURCH ST. NEW YORK CITY

# Pit *and* Quarry

Vol. 11

Chicago, Ill., January 15, 1926

No. 8

## Financial Statements

Financial problems are often a major consideration at this time of the year. There are some factors involved in the analysis of financial statements which are worth a little study.

A balance sheet is an orderly statement showing the financial condition of a business at a given date, setting forth the assets, liabilities and net worth of the business. In order to present properly the condition of the business, the net worth section of the balance sheet should be analyzed so as to show the changes from the date of the previous balance sheet.

Balance sheets are prepared for the purpose of showing the owners of the business its condition as at a certain date, to show security holders the condition of the business and to provide bankers with a basis to judge the "credit-ability" of the business. Balance sheets should have certain features of the business emphasized according to the use to which they are to be put. A sheet prepared for stock holders should emphasize the investment in productive equipment; for investors, the security behind the investment and for bankers especial attention should be given to the net working capital.

The balance sheet is a picture of the financial condition of the business at a given date. It should account for all the assets of the business and all of the liabilities to creditors. The difference between these groups represents the net worth or ownership of the business. This ownership may be represented by the investments of the owners (in the case of sole proprietors or partnerships) or the capital stock, surplus and reserves in the case of corporations. In balance sheets of certain institutions, the difference between the assets and liabilities is generally known as working capital or contingent reserve. In analyzing reserve accounts it must be remembered that some reserves do not represent ownership. As for example a "reserve for taxes" is merely an ap-

propriation of expenses incurred to be paid at a later date. Insurance reserves and reserves of a like nature are merely an estimate of expenses of this nature which have to be met later. Any excess of these reserves over actual expenses as determined later is a part of the surplus or owner's equity in the business. Depreciation and depletion reserves are mere valuation accounts off-setting any overstatement of these asset accounts due to wear and tear or the removal of minerals from the grounds. These reserves are deducted from the assets, but both the cost of the asset and the reserve should be stated on the balance sheet, so as to show what provision has been made in the expenses of the business to offset the losses due to depreciation and depletion.

The "income statement" is a statement showing the results from operations over a given period. An income statement should always accompany a balance sheet and the two should be studied together. In order to enable the investor or the banker to study properly the balance sheet and its accompanying income statement, the balance sheet should contain figures showing the position at the beginning and at the end of the period covered by the income statement. With the balance sheet in this form a better study can be made by comparison of the changes in the asset and liabilities account.

The study of the balance sheet should include the cash position, the working capital position, the ratio of ownership equity to the total indebtedness and whether or not distribution of net income is justifiable. The cash position and the working capital position should govern the distribution of the earnings. There should be no distribution of net income when the cash position of the business does not warrant such distribution.

The liabilities of the business should be arranged or grouped according to length of maturity. "Accounts payable" as a general rule

should mature within thirty to ninety days, notes payable, including acceptances, should mature in thirty days to one year and other items of indebtedness such as bonds, notes secured by mortgages and other secured liabilities should mature over periods longer than one year. The cash position of any healthy business should enable it to meet these maturing obligations at the time they are due. If the cash position of a business is such that it is unable to discount liabilities when due, this cash position is injurious to its credit. The average business should endeavor to keep its cash position so that the ratio of cash to current liabilities be maintained around twenty-five per cent.

The working capital of the business is the excess of its current assets over liabilities. The current assets should consist of items which can be converted into cash in the usual course of business. Close watch should be kept on any asset which loses this degree of convertability, and it is better for the business to take a small loss on a slow moving current asset than to permit this asset to become "frozen" to such an extent as to cripple the business. The ratio of current assets to current liabilities should be from 200 per cent to 300 per cent. A decline in this ratio to 150 per cent should be watched carefully, and the management should make every effort to bring this ratio up. The ratio and especially the cash position should be increased prior to maturity of fixed obligations in order that the maturing obligations may be paid or refunded. Business with good working capitals are in position to refund maturing obligations on better terms than concerns having small working capitals. Profits should not be distributed when the cash position will be weakened to such an extent as to prevent the concern from taking discounts or to such an extent as to weaken its credit. Collections should be watched, and accounts receivable should not be permitted to increase disproportionately to sales. The writer knows of a recent audit of a concern which showed profits of about 15 per cent on the capital, but there could be no distribution of profits because the cash position would not warrant such a distribution. The accounts receivable had increased to such an extent that the concern was not able even to discount its maturing obligations and

as a matter of fact was compelled to borrow funds for current operations. This is an indication of poor management, and it means that the debtors are running their business at the expense of this concern.

The total of all assets represents the total investment in the business. The total of all real liabilities on the balance sheet represents the extent to which the owners are using someone's money in the business. It is obvious then that the larger the investment by the owners, the better the creditor's position. This is of especial significance in the event of funded indebtedness. A decreasing ratio of owner's equity weakens the creditor's position, and inversely an increasing ratio of ownership strengthens the creditor's position.

The relation of fixed or funded indebtedness to total indebtedness should also be studied. A high ratio of funded indebtedness to total indebtedness means that the business is burdened with heavy fixed charges which must be met regardless of business conditions. Slack business means that the ratio of fixed charges to profits increases very rapidly, and in some instances this ratio is such that the margin of profit is almost, if not entirely wiped out.

Ratios should be shown on the income statement showing the ratio of expenses to revenues. This ratio will show the extent to which the income is used in expenses. Decreases in gross earnings are not always accompanied by corresponding decreases in operating expenses, because a certain portion of the expenses is fixed, and it is not possible to decrease them in the same ratio as gross earnings sometimes decrease. Fluctuations in gross earnings should be watched very closely, and expenses should be pared proportionately with decreases in gross so far as it is possible to do so.

The nature of the products manufactured or sold by the business should be studied. It is obvious that businesses handling luxuries or commodities affected by styles or obsolescence should be watched more closely than businesses handling necessities.

With all of these studies, which are important, of course, the real factors are the value of the assets and the earning power. These factors are in the balance sheet and the income statement and we must look to them for the worth of the business.



## Developing a Remarkable Institution The Greatest of Its Kind

By E. D. Roberts

### Part II

**A**FTER the most thorough and painstaking search for and testing of deposits and, overcoming what seemed to be unsurmountable obstacles, the Blue Diamond Materials Company is now producing gypsum plaster and products from their new gypsum quarry, located in the heart of the Great American Desert 30 miles southwest of Las Vegas, Nevada. Surrounded by all of the natural barriers and obstacles with which it seemed possible for nature to blemish any locality, we find the gypsum deposit forming the top of the highest peak of a remote desert mountain. It seems as though nature tried to hold this fine gypsum from man or, perhaps to challenge his vision, courage, and resourcefulness to develop it. The Blue Diamond Materials Company accepted this challenge and has turned one more bare part of the world to producing something worthwhile. It required the expenditure of



W. C. Hay



Gypsum Plaster Mill 10 Minutes Walk from Heart of Los Angeles

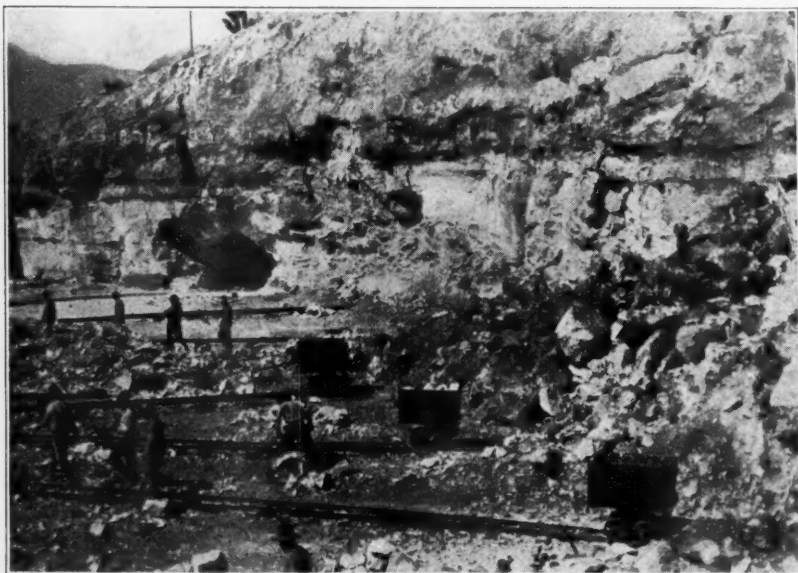


There Are 10,000,000 Tons of Gypsum to Work Here

over a million dollars, the construction of miles of railroad, aerial tramways, wagon roads, the development of their own power and water, the bringing in of everything required for the construction of one of the most modern quarry operations yet built and the accomplishment of what many prophesied was impossible.

The Blue Diamond Materials Com-

pany started operations ten years ago with a mortar box, a negro workman and a team of horses as the sole help and equipment of Mr. Hay in producing and delivering ready mixed mortar to the builders of Los Angeles. He had decided early to give a superior service, by having something better than anyone else, and to do things better than others. It was



Both Tunnel and Open Quarrying



Tunneling to Get Away from Winter Weather

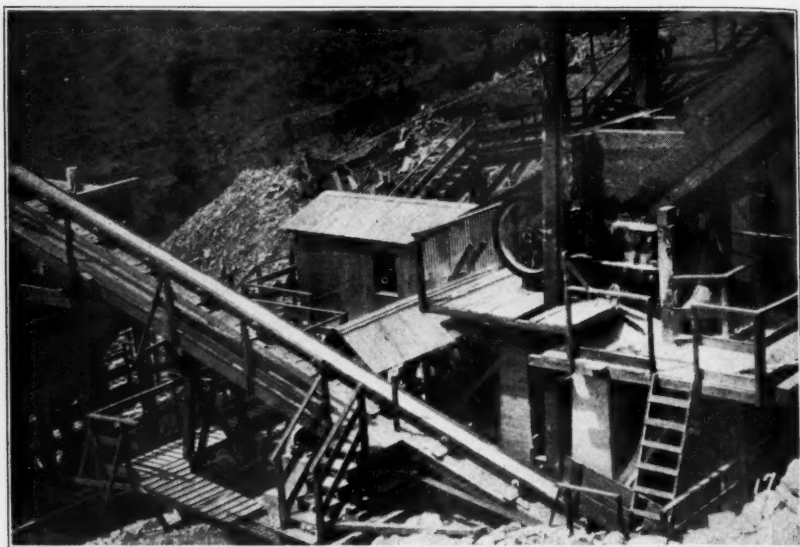
the following out of this policy that caused Mr. Hay to request his engineers and chemists to search for a superior deposit of gypsum. After combing the hills and searching the records of the western states for three years, they decided that here was one deposit which could measure

up to any other when quality was the prime consideration.

So painstaking and thorough was the search made by the Blue Diamond Materials Company that they even placed an airplane at the disposal of its experts for geological and topographical observations. Hundreds of



The Quarry Floor and Tracks

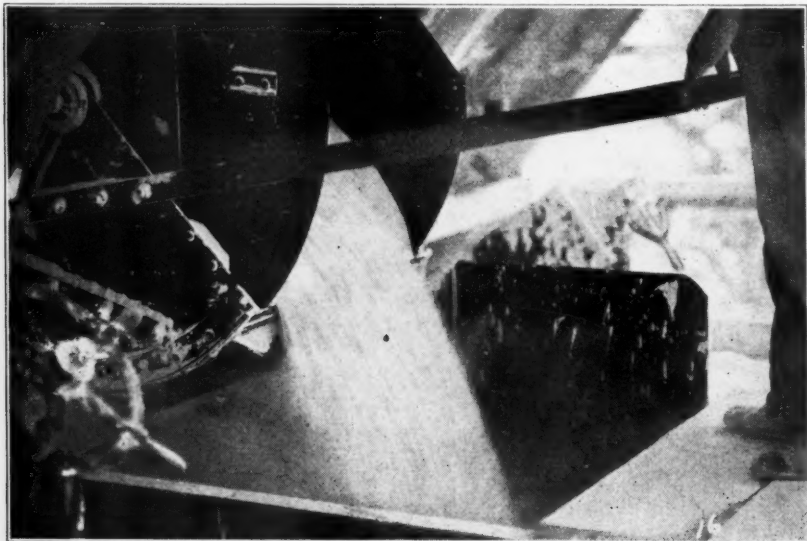


Jaw Crusher and Conveyor to Aerial Tramway Loading Bunker

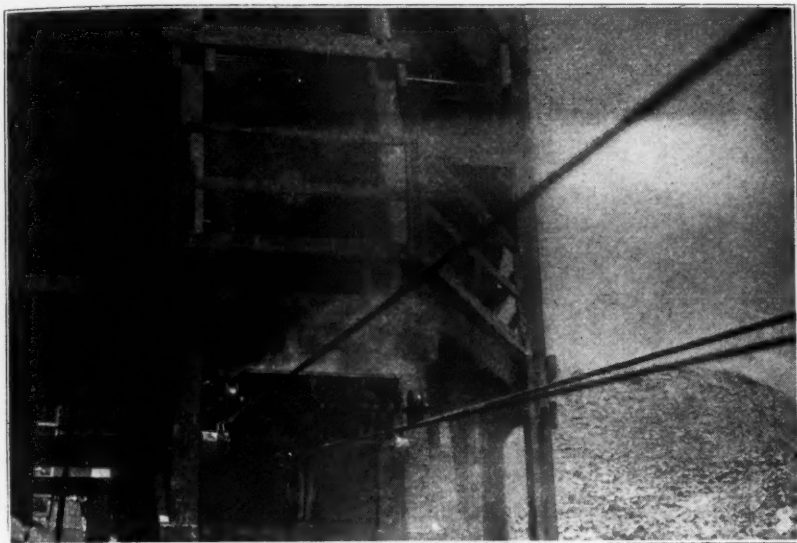
samples of gypsum were taken from every section of western America and tested exhaustively in the laboratories of the Blue Diamond Materials Company. Estimates of the comparative costs to develop the different deposits under consideration were made but the final decision had to be based on quality rather than initial cost or other considerations that might have

swayed the decision to some deposit inferior in purity and quality.

There were many other deposits of gypsum, more accessible and with many qualifications in their favor including the saving of hundreds of thousands of dollars in the cost of development but they lacked the main requirement—superior quality—and were consequently discarded.



Loading from Bunker to Tramway Hopper



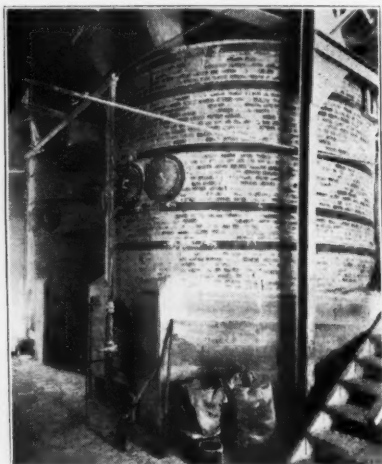
Tramway Bucket Grabbing Load for Long Journey

In line with the Blue Diamond Materials Company policy to do things in an efficient manner, the deposit was developed to produce enough gypsum to overcome the handicap of the enormous initial expenditure required through quantity and efficient production. This required the construction of eleven miles of standard gauge railroad from a point on the main line of the Union Pacific Railroad Com-

pany and at their own expense. Even this railroad did not solve the transportation problem for after climbing continuously at the maximum grade allowable for eleven miles they found themselves up against a stone wall at a point three quarters of a mile from the proposed quarry and 1,000 feet below it. An aerial tramway solved this problem and left them only the matter of quarrying the gypsum



Tramway at Half Way Point



View of Calcining Kettles

after suitable equipment could be transported to the quarry site, where over 10,000,000 tons of gypsum awaited development.

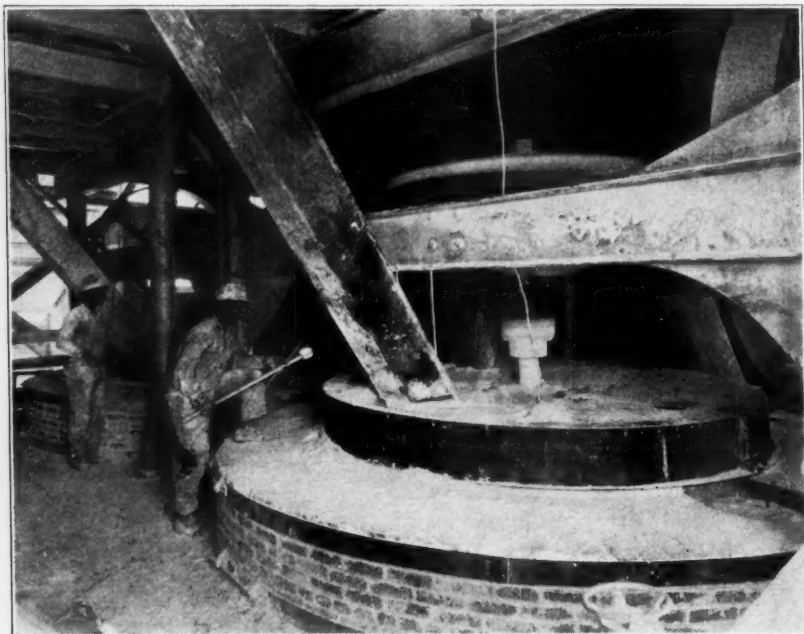
No highways were available in this section of the desert so that a wagon road 8 miles in length was constructed from the railroad spur terminus up through a narrow canyon with precipitous walls to the back door of the quarry.

Water for domestic and plant purposes had to be developed and pumped a long distance to the top of the mountain. Houses for the employes had to be constructed and necessities required for the betterment of the morale of the employes in such a "God forsaken place" had to be provided. These included such things as a refrigerating plant, electric lights, baths, stores, etc. Together they brought into existence the town of Blue Diamond, Nevada.

Some of the construction was extremely hazardous, for instance the foundations for the aerial tramway towers were constructed of cement concrete, the ingredients for which had to be handed and pulled up the sides of cliffs by men who were barely holding on with their "eyelids."

The length of the aerial tramway is 3,600 feet with a difference in elevation between loading and discharging terminals of 1,200 feet. The line is designed for a capacity of 80 tons of crushed gypsum per hour and at present has a capacity of approximately 45 tons.

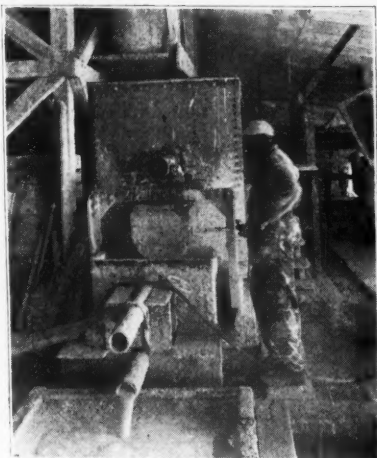
Actually, in our opinion, this tramway spans the roughest and hardest country that is covered by any tramway in America. To shift the discharge terminal 50 feet to the left



Top of Calcining Kettles

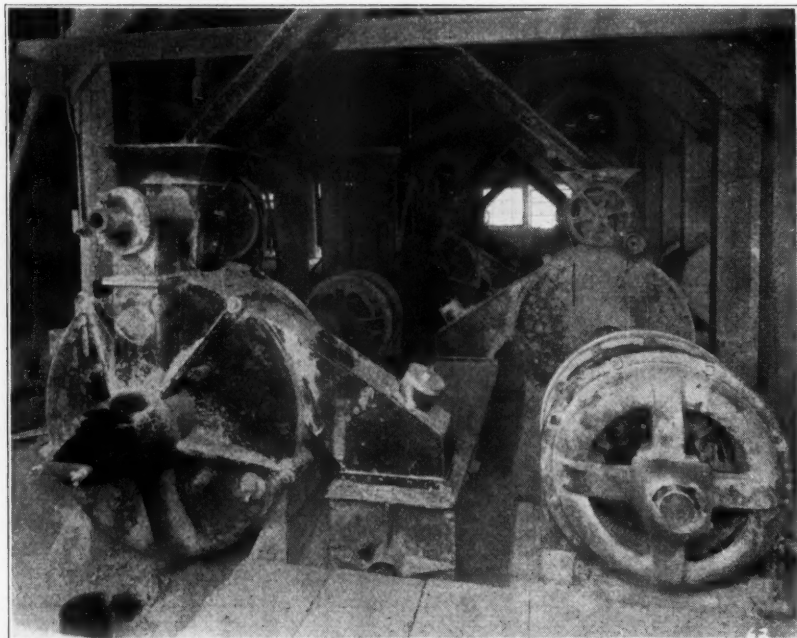
would have made it impossible to obtain any footing for supporting towers between the loading terminal and a point 2,000 feet distant. Shifting the discharge terminal 50 feet to the right would have been impossible because of the natural barrier presented by the side of the mountain. Between the loading terminal and a counterweight station 1,400 feet distant, you will note from the picture that the tramway parallels the face of the precipice. There are four intermediate towers between the loading terminal and this tension station, each tower foundation being on a small shelf of rock providentially placed for such a purpose. The distance between the supporting towers is approximately 400 feet. In each case all material had to be taken over a temporary cable way spanning from the loading terminal to the tension station. Not even a goat could successfully negotiate the mountain side between these tower sites.

Without this tramway, the Blue Diamond Materials Company, or no other company would have thought of going after the gypsum on the top of the mountain, and now that the line is installed and operating, they are handling their product from the crushing plant to the bunkers over the



Lime from Automatic Slacker

railroad spur for less than one cent per ton. An interesting feature of this particular tramway is that the gravity pull is sufficient to develop approximately 35 h.p. with the present tonnage being handled and this energy is used to operate the crushing plant. As their power costs them approximately 10 cents per kilowatt hour it is readily apparent that the tramway will soon prove a valuable



Two of the Vertical Buhrs



Automatic Aerating Machine

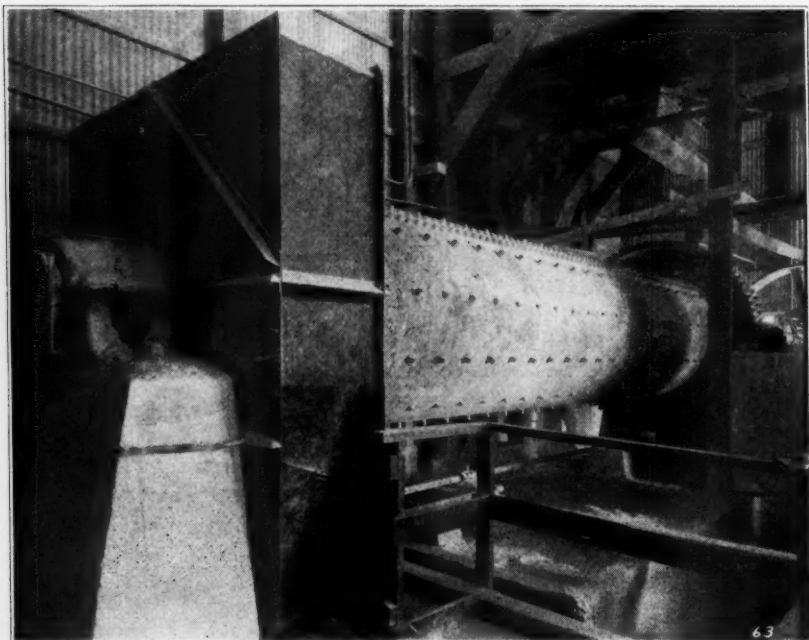
asset aside from its hauling advantages.

Open pit mining of the raw gypsum by hand is the method used at present in quarrying the gypsum. It is the intention to install a steam shovel to load the automatic dump cars now loaded manually. These dump cars are constructed by the Blue Diamond Materials Company, in their own shops in Los Angeles, and are of the

bottom dump type. A Plymouth gasoline locomotive handles the cars to the primary crusher where a tripper automatically dumps the cars into the bunker feeding the primary breaker and another tripper closes the car ready for another load of rock.

A pan feeder draws the gypsum from the crusher bin and feeds it to a 30x44 inch Ehrsam jaw crusher which gives the rock a preliminary breaking and discharges it to an Ehrsam rotary reduction crusher located below the first one. This reduction crusher discharges half-inch rock onto a conveyor belt that discharges the crushed gypsum into the tramway loading bin. This bin has a capacity of 120 tons and is equipped with a radial steel gate to draw off the crushed gypsum into the automatic loading hopper for filling the buckets of the aerial tramway.

The aerial tramway is of the automatic type, installed by the Interstate Equipment Company of New York, which picks up the burden at the loading station and discharges it at the terminal station without stopping the buckets. The operator draws of a charge of crushed gypsum into the loading hopper which is grabbed by the bucket on the run. He refills the hopper before another bucket arrives



Tube Mill Regrinder

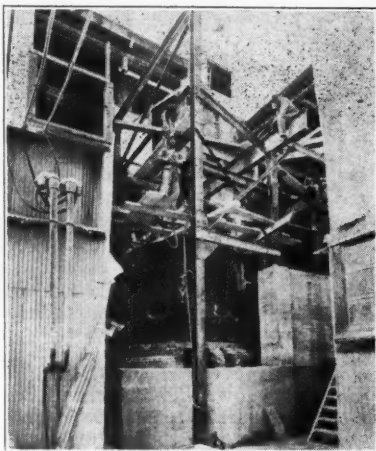


for its load. The buckets are spaced 407 feet apart, traveling at 360 feet per minute on a loop line aerial with two load line cables and two empty line cables. The present capacity is 40 tons per hour which can be increased by the addition of more buckets. Eleven towers ranging in height from 30 to 83 feet support this tramway throughout its length of 3600 feet during which it lowers the gypsum 1000 feet in elevation.

The terminal station where the buckets are dumped automatically is directly over the shipping bin. This bin holds 450 tons of gypsum and is equipped with spouts and radial steel gates to load the railroad cars by gravity.

A Fairbanks-Morse 150 horsepower diesel engine generates electric power for plant operation. Fairbanks-Morse ballbearing motors operate the crushers and other machinery about the plant. Two Chicago Pneumatic compressors, one furnishing 480 and the other 80 cubic feet of air per minute, comprise the pressure equipment.

The plant was constructed under the supervision of John Schriener, production manager of the Blue Diamond Materials Company. Glenn Bradley is superintendent of the gypsum quarry operations as well as in charge

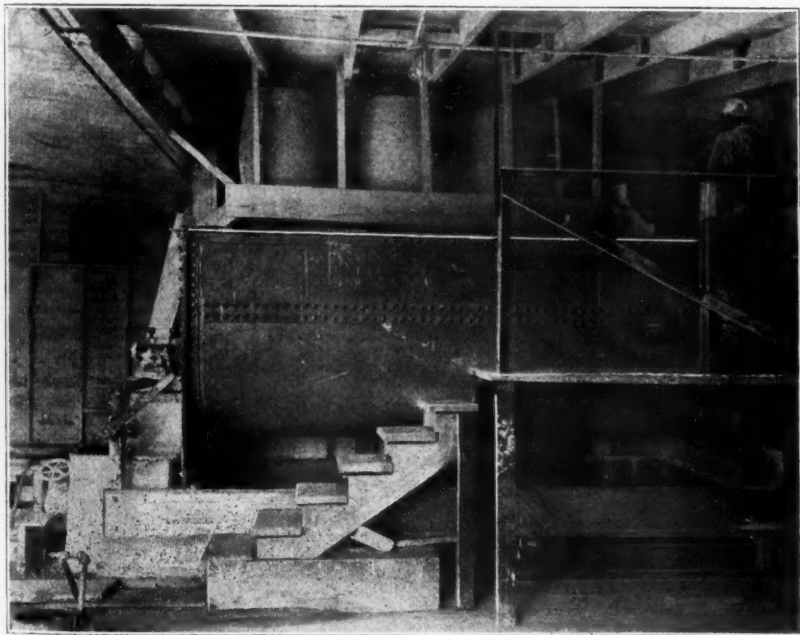


More Calcining Kettles

of the gypsum plaster mill at Los Angeles.

The gypsum is shipped to the Los Angeles and main plant of the Blue Diamond Materials Company over the Union Pacific Railroad in standard bottom dump cars.

Arriving at the Los Angeles plant of the Blue Diamond Company, the cars of gypsum are spotted over a track hopper and the bottom doors



Automatic Lime Slacker



Mixing Mill House

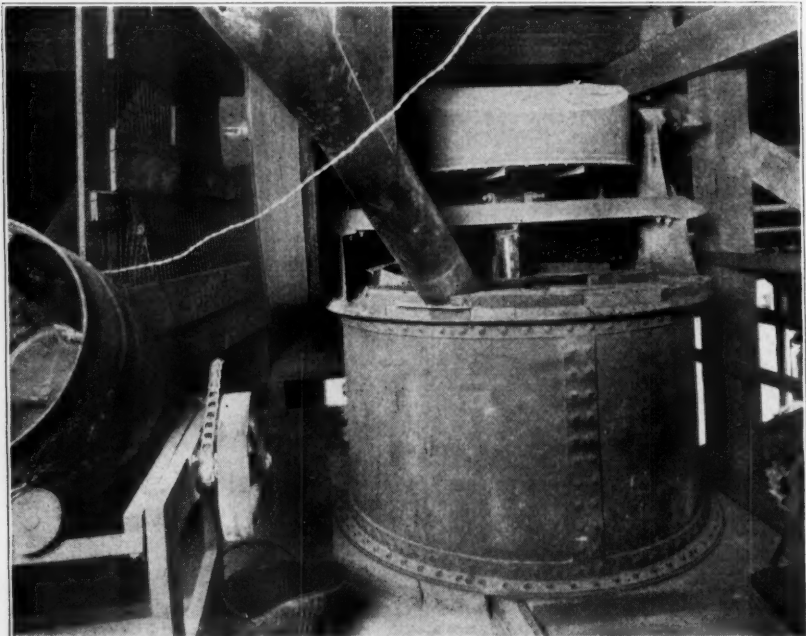
opened, allowing the rock to fall into the hopper below. The rock is fed from this hopper to a 16 inch bucket elevator which raises the material and discharges it onto an 18 inch conveyor belt running lengthwise over the top of the crude ore bin which will hold 440 tons of ore. It also extends on past the bin and is supported by a trestle over an outside storage area where the gypsum is discharged, in case the crude ore bin is filled to capacity. A conveyor belt operating in a tunnel underneath this outside storage pile reclaims the gypsum rock and discharges it to the bucket elevator mentioned above, which will in

turn deliver it onto the 18 inch conveyor belt, from which it is discharged into the crude ore bin by a traveling tripper.

Six spouts tapped into the bottom of the crude ore bin draw off the gypsum, leading it into one of the 6 Ehrsam buhr mills in line, which reduce it to a powder. A screw conveyor operates under the discharge of each mill collecting the ground material and transporting it to a bucket elevator. This elevator raises the powdered gypsum to the top of the building and discharges it into a screw conveyor which discharges into the kettle bin or land plaster bin as desired.

If sold for land plaster, the ground gypsum receives no further treatment but is drawn off into a hopper over a Bates valve packer which sacks it for shipment to the farmers who use it for fertilizer.

The material in the kettle bins is drawn off by spouts into one of the three 10-ton Ehrsam calcining kettles with extension tops which increase the capacity of each kiln to 12 tons or better. During the calcining period, careful watch is kept of the temperatures by observation windows and electric pyrometers. At the same time it is kept constantly agitated by



Air Light Mixer Where Color and Waterproofing Are Added

mechanical stirrers to insure against uneven heating and dead burning. When three quarters of the water of crystallization has been driven off which means that the chemical composition has been changed from  $\text{CaSO}_4$  plus  $2 \text{H}_2\text{O}$  to  $\text{CaSO}_4$  plus  $\frac{1}{2} \text{H}_2\text{O}$ , the calcined material is drawn off into a hot pit located along side of and below the kettles. These hot pits hold over two batches which allows time for cooling before further handling. The bottoms of the hot pits are hoppers towards 6 inch screw conveyors which draw off the material from the bottom and discharge it into a cross screw conveyor operating along the front of the three hot pits. From this conveyor it is discharged into a bucket elevator which delivers to a distributing screw conveyor operating over the top of three 150 ton stucco or regrinding bins. A screw conveyor draws off the material and discharges it to the regrinding mills below. An Ehrsam buhr mill and a Worthington ball mill with a special peripheral discharge perfected by the production manager of the Blue Diamond Company, John Schriener, reduce the material to the desired fineness and discharge it to a collecting conveyor operating under the mills. This conveyor discharges to a bucket elevator



Drawing Out Colored Stucco

that raises the material to a screw conveyor operating over the finish bin of 300 tons capacity.

The powdered material is drawn off from the bins into weighing hoppers holding one ton each. Each weighing hopper discharges into an Ehrsam one ton batch mixer into which the retarder is added and the two are thoroughly mixed after which it is dumped into a bin over a Bates Valve packer located on the shipping floor below. Each of these packers has three valves and fills three sacks of plaster at once.

The sacked plaster is delivered to the job by rail or by one of the 107



Stucco Mixing Hopper Resting on Scales



Machine Turning Out 4x6 Gypsum Tile

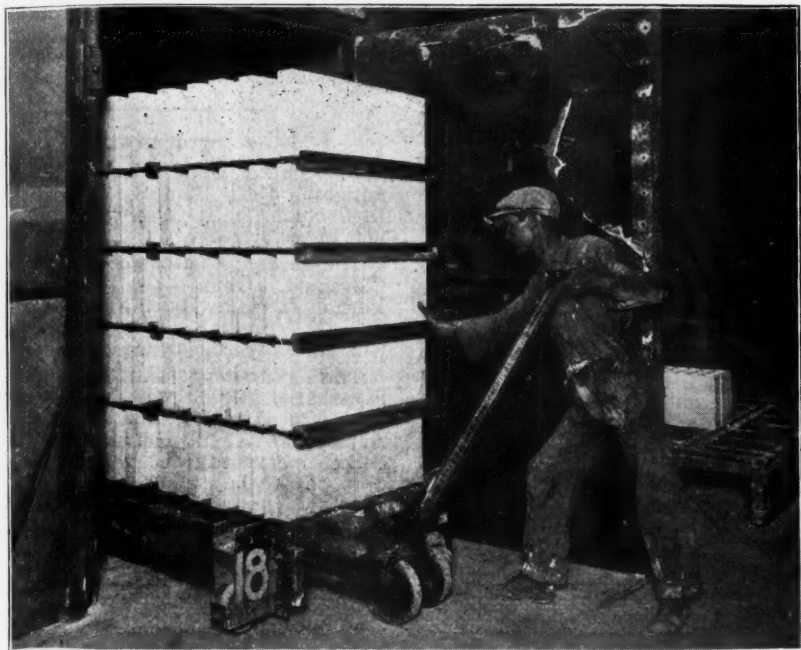
large trucks of the fleet of trucks owned and operated by the Blue Diamond Company. Incidentally, the company has lately added 6 wheel

trucks as their standard equipment and is the first in America to use a 6 wheel dump body truck.

The plaster mill is of structural



Automatic Machine Making 3 Inch Partition Tile



Tile Going to Drying Machine Direct From Moulds

steel frame construction covered by galvanized corrugated iron. Dust collectors are so placed as to eliminate

objectionable dust and improve the working conditions in the mill. Fairbanks-Morse ball bearing type motors



Tile Storage Room

are used throughout the plant.

The Blue Diamond Company maintains a thoroughly equipped chemical laboratory under the supervision and direct charge of Dr. H. J. Warsap. Here samples of the raw gypsum are tested, and the proper amount of retarder determined which is to be added to the stucco according to the locality to which it is to be shipped and kind of sand used.

The success of the Blue Diamond Materials Company can largely be attributed to furnishing high class materials and giving service with it. The word service has been incorporated in their trade mark. An idea of the lengths to which they go in this can be gained from the following. The truck drivers are paid more than other drivers and are selected after a thorough search of their records covering experience, conduct, and their capacity to act for the company in any emergency that might arise in the pursuance of their work. They are cautioned to be ever courteous and to do everything possible to create a feeling of good will toward the company on the part of clients and the public at large. As the trucks are kept spotless and neat with new white paint at a cost of \$40,000 per year, they are not to create a bad impression on the street by trying to "hog" the road or commit other infractions which a gentleman of the road would not do, but on the contrary to try to cause favorable comment and to cultivate a feeling of goodwill.

Glenn Bradley, who has charge of the gypsum quarry, is also in charge of the gypsum plaster mill. John Schriener, the company's production manager, has this unit under his supervision as well as the hundred other activities of the Blue Diamond Material Company. W. C. Hays is the

president of the Company and Kay M. Grier is executive representative. The office of the company is located at the Los Angeles plant.

### New Incorporations

Consumers Sand Company, Wilmington, Del., Capital \$100,000; T. L. Croteau, A. L. Miller, Alfred Jarvis, incorporators.

The Cement Contractors' Company, Cleveland, Ohio. Capital \$10,000. Vernon J. Wainwright, E. A. Kordick, Ira C. Vinneran, James H. Davis, Gus Rosen, incorporators.

The Strasburg Sand Company, Strasburg, Ohio; Capital \$10,000. John Van Atta, William Huber, John A. Seibold, E. E. Huber and K. C. Seikel, incorporators.

The Builders and Foundry Sand Company, Bedford, Ohio. Capital \$500. E. H. Donohue, P. J. Greeley, G. O. Briggs, Jr., Joseph A. Schlitz and J. Harold Traverse, incorporators.

Union Gravel Co., Monroe, La. Capital \$50,000.

Superior Sand & Gravel Co., Inc., Woodworth, La. Capital \$12,000.

The Clear Creek Gravel Co., Denver, Colo. Capital \$50,000. N. C. Bishop, H. C. Keiser and D. A. Roller, incorporators.

Riccardi Foundation and Cement Work Co., Capital \$5,000. F. and S. Ricardi, A. Tufaro, incorporators. (Atty. P. Viono, 261 Broadway, Manhattan, N. Y.)

The Pittsburgh office of the Browning Crane Company will be in charge of D. C. Harris who has long been associated with the company and will be located at 1201 Peoples Bank Building, Pittsburgh, Pennsylvania.



Blue Diamond Delivery Trucks as Far as You Can See. These Trucks Travel 8,500 Miles a Day or More Than Twice Across the Continent.

# Planning the Production of Asbestos Against Competition and Low Prices

By F. A. Westbrook

**P**RACTICAL operating men enjoy the successful solution of difficult problems and nothing can show more ingenuity than the laying out and starting of a plant in the face of keen competition and during a period of depression. Such an accomplishment connotes foresight and engineering skill which commands the respectful attention of the men in the field. These things have been done at the plant of the Maple Leaf Asbestos Corporation at Thetford Mines, Quebec.

This property is located in the township of Coleraine, about half way between the towns of Thetford Mines and Black Lake and about a half mile southeast of the main line of the Quebec Central Railway. Although this site is outside of the actual Thetford region asbestos deposit, the fibers resemble it closely. The "c" fiber is of an unusually pure white. Paper stock is white and uniform in texture, the "x" fiber, tough but not harsh and the carded crude exactly the same as Thetford crude. As talc is entirely absent its whiteness is purely a property of the asbestos itself.

## Formation

Two types of formation are encountered in the property. In one of

them the asbestos is in veins of crude from  $\frac{3}{4}$  to 3 inches wide, separated by masses of completely barren rock. In the other there is very little barren rock, less of the long crude but a good percentage of number 2 crude. Most of the rock, which is asbestos-bearing serpentine, is a good grade of mill ore.

The operation of this property was started in a small way many years ago, by a Dr. James Reed, but nothing was done on a large scale until 1920, when the present Maple Leaf Asbestos Corporation was formed. The cautious and intelligent manner in which this company functions was exhibited right at the start. Instead of plunging in with an expensive installation of machinery and other equipment, such buildings and machinery as were already on the spot were used as effectively as possible in order to determine the possibilities of the locations as far as practicable.

The results of this small scale operation were such that, by the autumn of 1920, it was felt justifiable to construct a larger plant and go into the business of producing asbestos in competition with other firms in that region.



Primary Crusher House and Belt Conveyor to Secondary Crusher



Left to Right, Secondary Crusher and Dryer; the Mill Tailings Belt Conveyor

#### Problem to be Faced

In undertaking the construction of this plant, the owners sought competent engineering advice with the result that it was planned with several important and far reaching ideas in mind. Probably nobody who has been through the experience will ever forget the high prices in the first part of 1920. Almost anything could be made and sold at a handsome profit, no matter how much it cost either the maker or the consumer. This applied to asbestos as well. The engineers, however, advised the owners that the high price level then obtaining could not last, that a period of depression was in all probability about to ensue and that if competition were to be met it was imperative to design the new plant so it would embody every practicable labor saving device and

otherwise to follow the most efficient practices applicable to existing conditions.

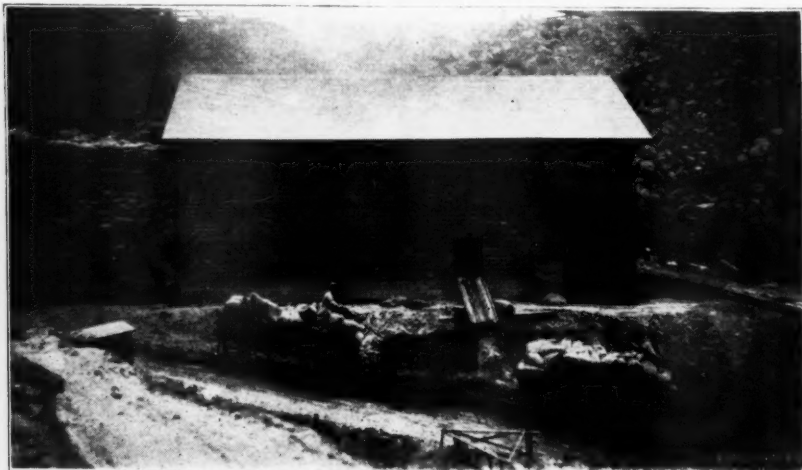
Four principal items had to be considered:

1. To keep the investment as low as practicable.
2. To balance the production of ore with the milling capacity.
3. To secure dumping space for tailings.
4. To transport material in process of manufacturing as efficiently as possible.

How these conditions were originally met and how they have developed as the work has progressed during the last five years, is described here.

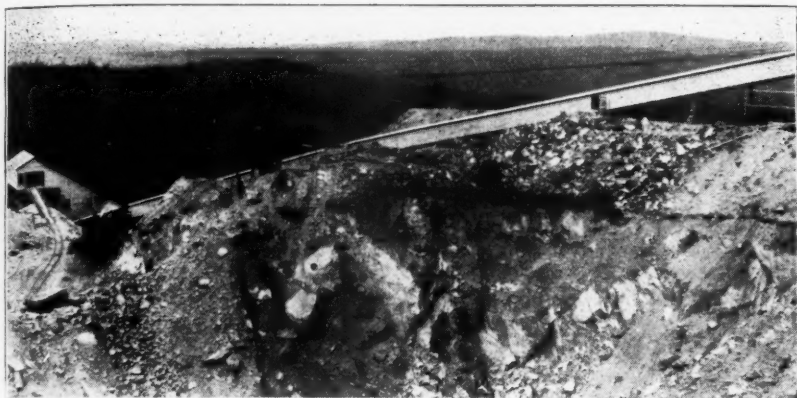
#### Mining

In the first place, the open pit was decided upon as the most economical



Store House and Loaded Trucks on Way to Railroad





View of Primary Crusher House and Belt Conveyor

because so much of the rock beginning near the top is commercial ore. Of course there were seams which it is economical to avoid until they had to be cleared away to reach others which are richer, but the general formation was such that any other method than the open pit was out of the question.

In regard to handling rock it was decided to use a cable derrick and cableways while the pit was shallow and the haul to the primary crusher short. With this arrangement the material was discharged from the cableway into a chute leading to the primary crusher.

After about four years the pit became much deeper and the distance to the primary crusher greater. Consequently the former method of han-

dling the rock, as was anticipated, was no longer economical. Consequently the cable derrick and cableways were discarded and a steam shovel and inclined tracks for dump cars leading to the primary crusher was substituted.

The steam shovel is a Marion  $1\frac{1}{2}$  yard crawling tractor type. By working this for eight hours a day it has been possible to dispense with the derrick and cableway and to drop 44 men from the payroll. Western type side dump cars, hauled by a Lidgerwood hoist, are used between the pit and the primary crusher. On account of the increased production which has been built up and the larger pieces of rock handled by the power shovel, it has been necessary to replace the original 15x30 inch jaw crusher with



Shovel at Work in Pit, Showing Formation

a 36x48 inch all steel Buchanan jaw crusher.

### Crushing

From the primary jaw crusher the rock descends by gravity through a shaker to a 24 inch Jeffrey belt conveyor with a Goodyear "Blue Streak" belt which carries it 500 feet at an angle of about 18 degrees to the 15x30 inch Farrell jaw crusher. This belt conveyor deposits the material in a 30 foot by 50 inch Ingersoll-Rand rotary dryer which is heated by burning coke. After drying, the rock descends by gravity to a number 3 Williams-Kennedy gyratory tertiary crusher.

From the gyratory crusher, the dry ore is conveyed by a 16 inch Jeffrey belt conveyor, on 80 foot centers, at an angle of about 23 degrees to the mill. At the point of entrance there are two bins, a large one of 600 ton capacity for the storage of surplus and a smaller one of one ton capacity which feeds directly into the machinery of the mill. The conveyor may be made to feed into either bin. As a general thing, the balance of output between the machines is such that ore from the crushers goes directly into the mill and is absorbed there; but circumstances sometimes

make it desirable to shunt the material into the storage bin. This provides for a certain amount of flexibility to take care of discrepancies in output between the crushing and milling operations. When the mill is supplied from the storage bin, the material is delivered by means of a Jeffrey bucket elevator.

The dry ore on entering the mill first goes through a Torrey Cyclone and then over rock screens. The fiber is taken off these screens by air suction and the rock continues on to a Laurie Cyclone. The discharge from the latter passes over another set of screens and the waste from these to a second Laurie Cyclone and screens and then to the tailing belt conveyor. This is a 16 inch Jeffrey conveyor equipped with a Goodyear "Blue Streak" belt. The grading is done on several sets of screens aided, under certain circumstances, by dusters. These screens may be varied in accordance with the stock which it is desired to produce; for instance, fiber suitable for shingles or soft fiber similar to paper stock. The finished fiber of various lengths is dropped into suitable bins at the opposite end of the mill from that at which the rock enters and within 15 feet of the



Bags of Asbestos Ready for Shipment

bag chute which discharges directly into the storage shed. The tailings belt conveyor is long and is in two sections.

It will thus be seen that from the time the rock enters the primary crusher until the bagging operation is reached, it requires no handling and only a minimum amount of attendance. Since the steam shovel has been in use even the raw rock in the pit requires little handling labor.

Drilling is done at night, even in winter with temperatures 40 degrees below zero. Denver rock drills, number 60 Waugh and number 95 Clipper, are used. An Ingersoll-Rand air compressor having a capacity of 340 cubic feet per minute supplies the air. For blasting, a 40 per cent SNG Canadian Explosives Company product is used.

Electric drive is used exclusively except for the shovel. The motors in use are as follows:

150 h.p. Westinghouse for the primary crusher and hoist for quarry dump cars.

150 h.p. Westinghouse for screens and Sturtevant fans in mill.

200 h.p. Westinghouse for cyclones or fiberizers in mill.

75 h.p. Westinghouse for Ingersoll-Rand Air Compressor.

30 h.p. Westinghouse for 2nd section of tailings belt conveyor.

5 h.p. Westinghouse for 1st section of tailings belt conveyor.

65 h.p. Crocker-Wheeler for secondary crusher and dryer.

50 h.p. Swedish G. E. for ore conveyor from primary to secondary crusher.

5 h.p. Canadian G. E., on short dry ore conveyor.

All of these are squirrel cage motors except the 65 h.p. Crocker-Wheeler and the 50 h.p. Swedish G. E. motor which are of the slip ring type. All operate on 2200 volts except those smaller than 50 h.p. which operate on 550 volt current. 2200 volt power is supplied by the Showinigan Falls Power Company.

The capacity of the plant is now 600 tons of rock per 24 hour day. This requires the services of 52 men per 24 hour day.

### Recent Patents

The following patents of interest to readers of this journal recently were issued from the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trade-mark attorney, Continental

Trust Building, Washington, D. C., at the rate of 20 cents each. State number of patent and name of inventor when ordering.

1,561,481. Longwall mining-machine. Edward O'Toole, Gary, W. Va.

1,561,584. Plaster-machine. Adelm M. Bates, Chicago, Ill., assignor to Bates Valve Bag Co., same place.

1,561,585. Packer. Adelm M. Bates, Chicago, assignor to Bates Valve Bag Co., same place.

1,561,586. Cement-packer. Adelm M. Bates, Chicago, Ill., assignor to Bates Valve Bag Co., same place.

1,561,587. Jigging device for bag-filling machine. Adelm M. Bates, Chicago, Ill., assignor to Bates Valve Bag Co., same place.

1,561,588. Cement-packer. Adelm M. Bates, Chicago, Ill., assignor to Bates Valve Bag Co., same place.

1,561,632. Perforated screen. Herbert S. Woodward, Carbondale, Pa.

1,561,694. Scoop attachment for power-operated excavating apparatus. Bird C. Clutter, Akron, Ohio.

1,562,207. Method of making cement. Andrew G. Cröll, Weatherly, Pa., assignor to Atlas Portland Cement Co.

1,562,288. Pull-shovel. Paul Burke, Green Bay, Wis., assignor to Northwest Engineering Co., same place.

1,562,617. Crushing-roll apparatus and process. Henry K. Burch, Los Angeles, Cal.

1,562,618. Grinding system for ore, rock, etc. Henry K. Burch, Los Angeles, Cal.

1,562,669. Stuffing-box for steam shovels. Charles A. Weber, Lorain, Ohio, assignor to Thew Shovel Co., same place.

1,562,741. Excavating and dumping apparatus. James H. Coyne, Port Townsend, Wash.

1,562,791. Discharge-head for grinding-mills. Joseph P. Ruth, Jr., Denver, Colo.

1,562,792. Discharge for grinding-mills. Joseph P. Ruth, Jr., Denver, Colo.

1,563,047. Sand-riddle. Mitchell J. Somers, Springfield, Ohio.

1,563,568. Winch-control mechanism. Roger S. Hoar, South Milwaukee, Wis., assignor to Bucyrus Co., same place.

1,563,755. Process of manufacturing cement. Carl Leonardt, Los Angeles, Cal.

1,564,041. Grab-bucket. Clifton N. Windecker, Plainville, Ohio.

1,565,107. Method of hydrating lime. John P. Rich, Swanton, Vt.

### Schweim Takes Marani's Place

Henry J. Schweim has been appointed chief engineer of The Gypsum Industries, 844 Rush Street, Chicago, Illinois, to succeed the late Virgil G. Marani who held the position for many years prior to his death. These men were personal friends and for a long period were engineering associates.

Mr. Schweim is in close contact with architects, engineers, contractors and builders and has hosts of friends among them. His reputation for rendering service is well known and he will carry on these policies in his new position.

He is a young man and looks on gypsum as a product which will more largely serve in building construction



Henry J. Schweim

in the future, despite the great progress it has made in the last decade. Its field as a fire resistive medium has just begun, he believes.

His engineering education was received at Armour Institute of Technology. He was associated with Mundie and Jensen, architects, with the National Fireproofing Company as chief draftsman and with the United States Gypsum Company as sales engineer, supervisor of sales, testing engineer, and as district manager. During the war he was sent to New York to serve the government in securing supplies of gypsum building products and to act in engineering advisory capacities. Thus his technical training has been backed by a wealth of practical experience.

### New Florida Asphalt Plant

One of the quickest installations of a road-building unit on record is the installation of the Andrews Asphalt Paving Company, who are under contract to surface the Camino Real at Boca Raton and to surface other streets in a contract that runs over a half million dollars. The plant of the Andrews Company is at present in operation on the Dixie Highway, one half a mile south of the new Administration Building at Boca Raton.

The entire installation was brought from Ohio on specially built railroad cars. It was reassembled at Boca Raton, where it is now making asphalt that is being spread over the two hundred and twenty foot width of the Camino Real. A sufficient supply of asphalt has arrived over the lines of the Florida East Coast to keep the present plant working to capacity.

The Andrews Paving Company holds a contract for the entire streets improvements of one of the plats in Boca Raton development. At their present speed, it is believed that an incredibly short time will see the roads completely finished.

The use of asphalt in road building in southern Florida has received a new impetus. The shortage of rock has been responsible for this in a measure. Another feature that has made the use of asphalt more advisable is the fact that the principal thoroughfares of the metropolitan centers of the east and west have turned to asphalt as the ideal type of paving to give long wear under severe traffic conditions.

The Andrews Paving Company has built a barracks to house the men working on their force at Boca Raton, and will maintain them there until the entire streets development program in which they are interested is completed.

The work on the Ocean Boulevard, which is being widened to eighty feet, is progressing rapidly. The fill that will skirt Lake Boca Raton is being added to daily and trucks are run over from the site of the Ritz-Carlton loaded with the dirt that is added to the fill.

The Link-Belt Company, of Chicago, announces the opening of a branch office in the First Wisconsin National Bank Building, Milwaukee, Wisconsin, with R. C. Kendall in charge.

## A New Crushed Stone Plant Enters Field at Plattsburgh, New York

**A**DOLPHUS FLORENTINE has started a new stone quarry and crushing plant at Plattsburgh, New York. There is a large demand for crushed stone in this region on account of the activity of improving roads. Plattsburgh is an important center for the great number of summer vacationists congregating around the northern end of Lake Champlain and in the Adirondacks. It is also on the direct automobile route between New York and Montreal. Consequently good roads are necessary and the demand for crushed stone is continuous and ever increasing in volume. Besides in a city the size of Plattsburgh there is also a good deal of building construction involving concrete work and the use of crushed stone.

The lime stone in this region is near the surface in many places with frequent out-croppings. In Mr. Florentine's new operation there is little stripping to be done. In fact the top soil is not much over a foot thick and in some spots even less. It is done with pick and shovel. The soil is generally loaded directly into wagons and is sold without rehandling. It brings as good a price as the crushed stone.

Drilling is done entirely by Ingersoll-Rand jackhammers. The holes are usually drilled about ten feet deep,

four feet apart and five feet back. Hercules 40 per cent dynamite is used for blasting. The blasting must of necessity be rather light because the quarry is within the city limits and there are residences nearby. Not much secondary blasting is needed on account of the brittle nature of the rock. Pieces which are too large for the crusher are mostly broken up by hand with sledges.

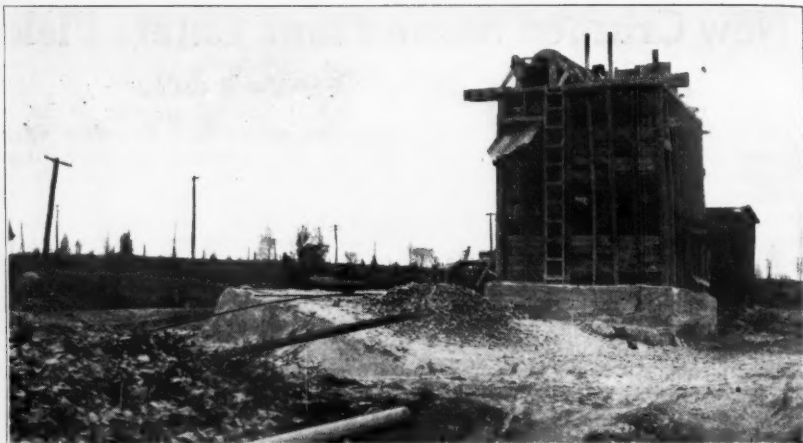
The stone is taken in horse drawn dump carts to the crusher. There are three of these carts. A 2½ inch Climax jaw crusher located below a dumping platform, is driven by a 30 h.p. General Electric 220 volt induction motor equipped with 10 inch "Bull Dog" belt made by the Boston Woven Hose Company.

The motor is located in a small pressed steel house to one side of the dumping platform and in this same building is the air compressor. This is an Ingersoll-Rand 7x6 machine driven by a 5 h.p. General Electric motor and starting box.

On the opposite side of the dumping platform from the small house is the bucket elevator and screen. These were supplied by the Good Roads Machinery Company and they are driven from the same motor which drives the crusher. It is interesting to note that the crusher is so well adapted to the character of the rock



Beginning the New Quarry Drilling with Jack Hammers



View of Screen Bins Showing 12 Day's Tailings

that there are practically no tailings from the screen. They amount to little more than two or three bushels a day and consequently it is not necessary to make any special provision for taking them back to the crusher automatically.

Horse drawn wagons and motor trucks are used for delivery purposes as it is frequently necessary to deliver crushed stone to places where motor trucks cannot go because of soft or excessively rough ground. Two Cooke Frankfurt Wagons, made by the Acme Road Machinery Co., are used for this work. They are weighed by a Fairbanks-Morse Scale.

There are also seven motor trucks.

Four of these are Ford trucks, with hand dumps. Two are one and a half ton Garford trucks of which one is equipped with a hand hoist and the other with a St. Paul hydraulic hoist, manufactured by the Hydraulic Hoist Company. Finally there is one five-ton Hurlburt truck equipped with the St. Paul hydraulic hoist.

Benjamin Hudson Ryder, electrical engineer of the American Steel and Wire Company for the past twenty-four years, died suddenly December 26th. He was widely known in the electrical and railroad circles of the country.



Dump Cart Hauling Stone to Crusher. Note Thin Top Soil

You can operate your cranes, derricks, dredges, excavators and shovels at less cost if you use—



because "HERCULES" has both the strength and endurance necessary for such work. Its actual performance has proved that it keeps equipment at maximum efficiency.

Made Only By

**A. Leschen & Sons Rope Co.**  
ST. LOUIS  
New York Chicago Denver  
San Francisco



**"HERCULES"**  
(REG. U.S. PAT. OFF.)  
**RED STRAND  
WIRE ROPE**



### *On a Desolate Mountain Peak the*

Miles from water—

Miles from a railroad—

Miles from human habitation—

At the very peak of a high desert mountain—  
was the end of a three year search, but only  
the beginning of a great development.

The search ended in the finding of a vast  
deposit of pure Gypsum at Arden, Nevada,

by the Blue Diamond  
Company of Los Angeles.

It cost more than a million  
dollars to build a railroad, to cut a  
concrete pipe water from a well  
to the site, for workers to live, then  
to bring in the machinery for doing  
the job. The job declared was "too big  
ever

**PLYMOUTH**  
*Gasoline*



**BLUE DIAMOND COMPANY**  
**Los Angeles**

October 1, 1925.

The Fate-Root-Heath Co.,  
 Plymouth, Ohio.

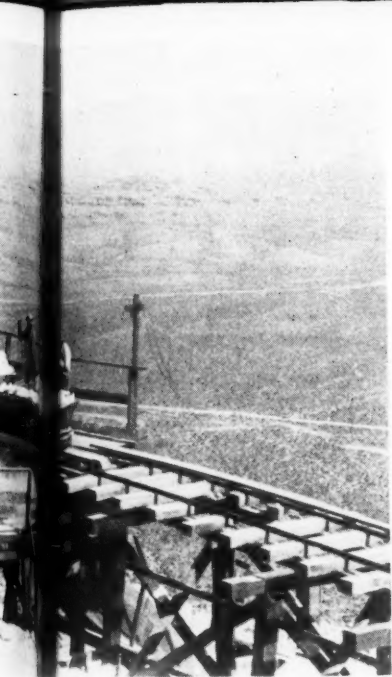
Gentlemen:

The 4-ton Plymouth Gasoline Locomotive which we purchased from you some time ago for hauling quarry cars at our gypsum quarry at Arden, Nevada, has given entire satisfaction. We are particularly pleased with the efficiency of this locomotive from the standpoints of low operating expense, total absence of repair costs and power.

Should we again be in the market for a gasoline locomotive, the writer does not hesitate to state that we would buy another Plymouth.

Yours very truly,

**BLUE DIAMOND COMPANY,**  
 (Signed) C. R. Howe,  
 Manager of Purchases.



**Peering the Great American Desert—**

...illion dollars to build  
 ...on trail to the top, to  
 ... well, to erect houses  
 ... then finally to install  
 ... job which many de-  
 ... ever be attempted.

Now the rock from this great deposit is moving in a steady stream to Blue Diamond's modern plaster mill in Los Angeles. Dependable service, under such conditions, is imperative, so naturally the Plymouth was chosen for the quarry haulage.

**THE FATE-ROOT-HEATH CO.**  
 Plymouth Locomotive Works  
 PLYMOUTH, OHIO

**PLYMOUTH**  
**Locomotives**

# INDUSTRIAL



## DOES IT MEAN ANYTHING?

**W**HEN four hundred and twenty railroads all over the world use INDUSTRIAL CRANES, and keep on buying them;—when one railroad alone owns 232 INDUSTRIALS—does it mean anything? Can a railroad's judgment be counted as worth while?

It is not for railroads alone that INDUSTRIALS are built; they are found in every branch of industry. There is an INDUSTRIAL for every need, in capacities ranging from 5 to 200 tons. Tell us your problems—our engineers are at your service.

The illustration shows an INDUSTRIAL crawling tractor crane which is also a shovel, dragline, pile driver, clamshell, grapple, magnet—all in one. And you can depend on it to give maximum efficiency in each service.

This type DC is operated by steam, gasoline, electric or Diesel power.

*Write for Book 120-A*

**INDUSTRIAL WORKS · BAY CITY · MICHIGAN**



## Labor Saving Methods Reduce Costs For the Oregon Gravel Company

By E. D. Roberts

**E**FFICIENCY studies made of the operations of large companies generally result in an increased profit through savings caused by the introduction of new methods, the installation of labor saving equipment and machinery, or the better use of raw materials. The Oregon Gravel Company of Salem, Oregon, was able to effect a saving in the operation of their sand pits that will more than pay for the cost of additional equipment in one season's operations, by installing a portable Model T Ersted Hyster, a double drum hoist attached to a Fordson, in their tow sand pits to excavate the material. This machine replaced three men and two teams in addition to doubling the output and reducing the pit charge from 32 to 15 cents per yard.

The main plant of the Oregon Gravel Company is located within the city limits of Salem, and on the banks of the Willamette River. Gravel is excavated from the bottom of a secondary channel of the river by a two-yard home made drag bucket operated on a 900 foot slack and tight line track cable. This gravel is sorted and washed and the oversize material crushed to the proper sizes. As the deposit runs largely oversize the Oregon Gravel Company does not have enough sand to meet their market requirements and for the operation of their two concrete products plants. These two concrete products plants enable the company to



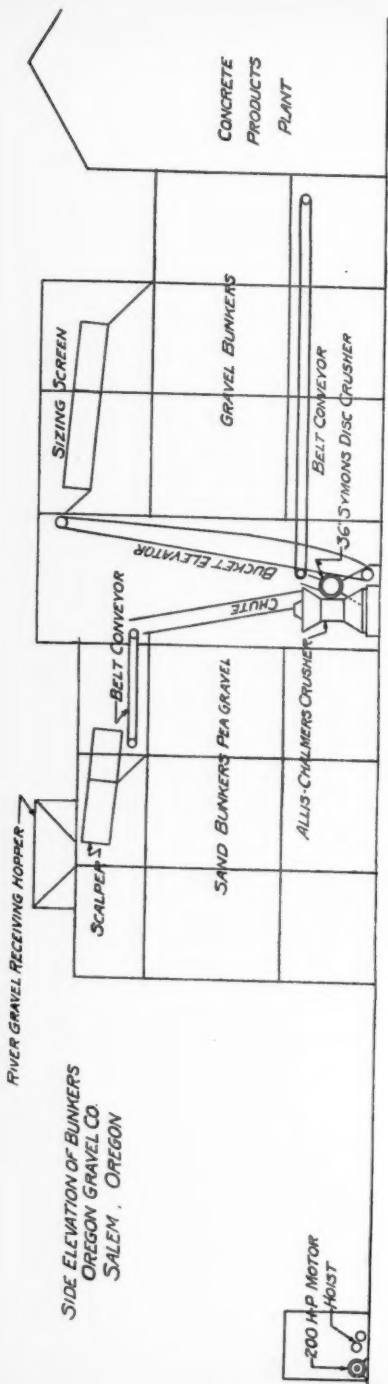
Bucket Used in Digging Gravel

keep their organization together the year around which is most important as it rains most of the time from October to May.

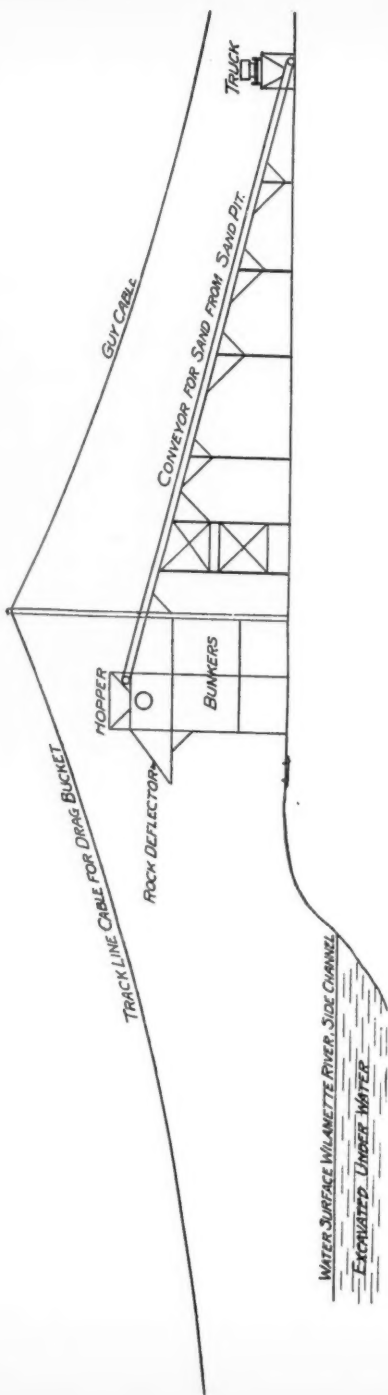
There is also a considerable demand for fine sand to be used for a filler in black top paving mixtures. The



View of the Oregon Gravel Company's Plant



SIDE ELEVATION OF BUNKERS  
OREGON GRAVEL CO.  
SALEM, OREGON



WATER SURFACE WILANETTE RIVER, SIDE CHANNEL  
EXCAVATED UNDER WATER

dust from the rock crushing operations was saved for this but it was not sufficient to supply the demand.

Search was made for a deposit which would furnish a suitable concrete sand and also a very fine sand. The company's best hopes were realized in the acquisition by lease of 120 acres of high water channel and old river bed of the Willamette River located about five miles below the main plant and near a hard surfaced road. This tract is overlaid with about 12 feet of sand and silt without an overburden. The sand nearer the river is a good concrete grade and the fine sand or silt is farther inland. The necessity for producing two products from this tract, from points widely separated practically simultaneously, made obsolete the original method of excavation by teams and scrapers but the yardage demanded was not sufficient to justify a big expenditure for modern machinery for two separate pits.

With the perfection of the portable double drum Hyster hoist it was thought a saving could be accomplished over the old team and scraper method by installing one of the hoists. After repeated trials it has been found that the machine can be operating in the fine sand pit and in one hour and twenty minutes excavation can be full swing in the concrete sand pit 500 feet away or vice versa and at the same time eliminating three

teams and two men from the pit force.

According to a report prepared by the Users Service Department of the Ersted Machinery Manufacturing Company, based on a 300 day year and an 8 hour day the saving at the Oregon Gravel Company plant is as given below:

"The Hyster and Fordson have proved a salvation to us," said A. B. Kirby, superintendent of the pit. "We were using two teams and drivers and an extra man at the bunker and our cost for this part of the work was averaging 32 cents a yard. Our season for removing sand is limited to six months of the year, owing to the fact that during the rainy period the water in the river rises over the sand pit, so we have to work fast during the short time allowed for removing the materials.

"The Hyster and Fordson are handling a ½ yard bucket, which we built ourselves, over a haul of 200 feet, averaging 20 yards an hour. We have only two 4-yard trucks available at the present time which haul the material from the pit to our plant, a distance of five miles, or ten miles over the round trip. Each truck averages one round trip an hour. You see by this, we are taking out about 80 yards a day and that the Hyster is working only half of the time.

"On the basis of our present output, the Hyster-Fordson has reduced our cost to 15 cents a yard. If we had

#### INVESTMENT:

Tractor .....	\$ 575.00
Hyster—Double Drum .....	450.00
Smith Unit Pulley .....	35.00

\$1,060.00

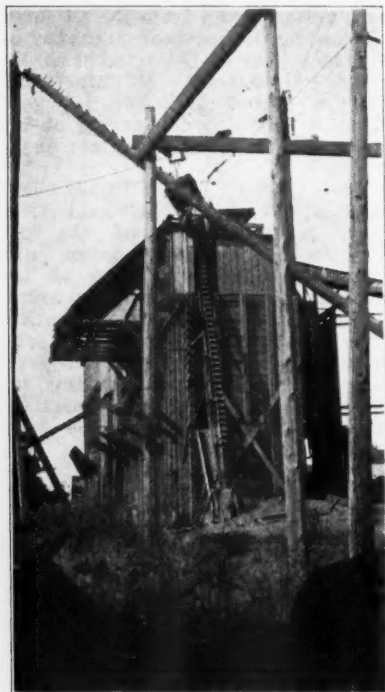
#### ANNUAL FIXED CHARGES:

Interest on \$1,060.00 @ 6 per cent .....	\$ 63.60
Depreciation on \$1,060.00 @ 12½ per cent .....	132.50
Repairs to Tractor and Pulley \$610 @ 25 per cent .....	152.50
Repairs to Hyster \$450 @ 25 per cent .....	90.00

\$438.60

#### DAILY CHARGES:

Fixed charges 438.60 divided by 300 days .....	\$ 1.46
Twelve gallons gas per 8 hours @ 21 cents .....	2.52
One-half gallon oil per 8 hours @ 55 cents .....	.28
Grease and changing engine oil every 30 hours—3 gallons per 30 hours or 0.8 gallon in 8 hours @ 55 cents .....	.44
Operator—wages per day .....	6.00
Helper .....	3.50
Output of sand and gravel delivered by Hyster-Fordson to bunkers— 20 yards per hour—160 yards per day—	
Cost per yard—\$14.20 divided by 160 .....	.888
Cost per yard—using teams .....	.32
Saving effected by Hyster-Fordson .....	.2312
Percentage of reduction in handling cost per yard .....	.725



Looking at the Bunker from Hoist House

five trucks available so that the Hyster could work to its full capacity, our cost would run about 9 cents a yard, a saving over our method of handling by teams of \$40 a day, of \$6,000 over the six month period.

"In a test to see just what we could accomplish, the Hyster pulled in 34 yards in one hour. A handy thing about the outfit is that when we want to move to another location, we can change our entire setup in about an hour. All we have to do is change

the location of our anchor cables and the tractor moves itself where we want it in just a few minutes."

The stationary equipment at each pit consists of a bunker with spouts to load auto trucks by gravity. Inclined 16-inch belt conveyors operated by 8-h.p. Fairbanks-Morse gasoline engines carry the sand up and dump it into the loading bunkers. Excavation is by a half yard drag line bucket operated by the Hyster which discharges its load onto a grizzly over a hoppers chute leading to and feeding the sand to the inclined belt.

Fifteen hundred cubic yards of the fine sand, 20 per cent of which will pass the 200 mesh screen, for black top paving filler and 500 yards for garden use is a season's output of the fine sand pit which is delivered directly to the customer by auto trucks. About 9,000 cubic yards of the concrete sand is hauled to the main plant at Salem and stored for winter use in addition to the requirements during the dry season. The high water stages of the Willamette river make the two sand pits inaccessible and no attempt is made to operate them during the rainy season.

Arriving at the Salem plant, the concrete sand is dumped into a hopper which feeds the sand to an inclined belt conveyor that carries the sand to the top of the sand and gravel bins where it is discharged into a revolving screen into which a 4-inch stream of water is thrown by a Byron Jackson centrifugal pump. The sand and water passes through into an Allen sand cone that dewateres the sand and discharges it into the bins below. The pea gravel falls into a bin alongside of the sand bin and the rejects are discharged onto a 16-inch conveyor belt together with the gravel



Scraper Discharge and Incline to Plant

excavated from the river bed which has also passed through the washer and primary screen and has had the sand and pea gravel sorted out and placed in their proper bins.

The method of excavating the gravel from the bed of the river is novel and efficient. A two yard home made drag bucket is attached to a trolley which runs back and forth on a tight and loose cable. Tightening the cable raises the bucket and trolley, while loosening it lowers the bucket for digging. The tight and loose or track cable is operated by one of the drums on a double drum Smith and Watson hoist directly connected to a 200 h.p. General Electric motor. To dig, the track cable is loosened allowing the bucket to fall into the water, the haul in cable is wound on the other drum of the hoist dragging the bucket along the river bottom until the operator tightens the track cable and lifts the bucket out of the water.

At the same time, the haul in cable is being reeled in which hauls the bucket to the gravel receiving hopper over the washing and scalping screen, where it is dumped by slackening off on the haul in line which causes the bucket to dump automatically. The drag bucket runs back out to the digging position by gravity as the bunkers are set on a high bank well above the river giving a gradient to the track cable such that the bucket will run out at any desired speed.

There is a large area of gravel bearing river bed in close proximity to the bunkers which they have been operating in for several years but, as the Willamette River reaches high velocities during flood stages, each spring and winter freshet brings in more gravel thus insuring an inexhaustible supply.



The Path of the Scraper Bucket

The gravel from the bucket goes through the same scalping and washing screen as that into which the sand is discharged, reaching the screen by gravity flow from the hopper into which it was dropped by the drag bucket.

Conveyed from the scalping screen on a 16-inch belt conveyor and discharged into an Allis-Chalmers crusher, operated by a 75 h.p. General Electric motor, the oversize gravel is crushed to a 2½ inch maximum and



The Inhaul Path to the Plant

discharged to an inclined bucket elevator which in turn discharges the crushed material into the sizing screen over the crushed rock bins. Three sizes are produced by this screen:  $\frac{1}{4}$  to  $\frac{3}{8}$ ,  $\frac{3}{8}$  to  $1\frac{1}{4}$  and  $1\frac{1}{4}$  to  $2\frac{1}{2}$  inch crushed rock.

A belt conveyor has been installed under the crushed rock bins to draw off the crushed rock and bring it back to the crushing room for further reduction where it is discharged into a 36 inch Symons horizontal disc crusher so placed that it will discharge into the same bucket elevator that carries the discharge from the Allis-Chalmers crusher to the sizing screen. The demand at times requires a large percentage of small material which is obtained by this regrinding.

The bunkers for the sand, pea gravel, and the crushed rock are placed in line and alongside of the tracks of the Oregon Electric Railway with spouts to load cars spotted alongside. Trucks are loaded on the other side by similar spouts on that side.

When possible, shipments are made direct from the bunkers, but at times more material is produced than the market will take so it is drawn off into trucks and stored on the ground nearby. A Byers truck crane aids in this operation as well as reclaiming the materials later. It also aids in mixing the various sizes when this is desired.

The concrete products plant operated in connection with the sand and gravel business has facilities for the production of many kinds of building materials. The list includes, Shope brick, Walters roof tile, cesspools, burial vaults, building and drain tile, and culvert pipe of all sizes. Each product is made in separate molding units advantageously placed around a central concrete mixing machine.

Sand and pea gravel in the proper proportions are dumped into a hopper by auto trucks. A bucket elevator raises the material and discharges it into a bin in the top of the mixing building. It is drawn off from the bin and mixed by machine into a dry concrete and discharged into a bucket hanging to an overhead trolley which carries it to the proper moulding machine.

The moulded products are placed on palates or frames to support them until cured. These carriers are trucked to one of the three large curing rooms on rubber tired trucks

which pick up and deposit the load by moving a lever. After curing the finished products are again picked up by the truck and transported to the storage yard at the end of the curing rooms. This storage yard is between the railroad track and auto truck road minimizing the final handling of the materials during loading for shipment.

The officers of the Oregon Gravel Company are: B. C. Niles, president; R. C. Niles, manager, and A. B. Kirby, superintendent.

### New Design Boom and Dipper Stick

Frequent breakdowns and expensive maintenance of the shovel boom and dipper stick on crawler cranes has been an ever present source of annoyance to both the owner and operator of this type of equipment. With these facts in mind engineers set out to design and build a new shovel boom and dipper stick, which, when combined with good engineering practice and great strength, would eliminate practically all trouble from this source.

Their success has been one of the outstanding engineering accomplishments of the day. There are now in operation some forty machines with this improved dipper shovel attachment, on work ranging from ordinary digging to the hardest kind of excavation, grading and quarrying service.

Recently a survey was made of all of these operations, by the Link-Belt Company on whose all-purpose crawler this new stick is being used. It was found that both the booms and dipper sticks were giving excellent service, with negligible attention. In many instances it was found that the service was what ordinarily would be considered very destructive. Some of the machines (mainly in Florida) were working against time, and were being operated continuously three eight-hour shifts per day, with no evidence of the commonly looked for weakness.

The Kent Machine Company, announces the appointment of F. C. McLaughlin as director of sales for their Red Line concrete products machinery. Mr. McLaughlin has served the company for some time in the capacity of Sales Director for the Special Machinery Division, and has also had charge of all purchasing.



## Business Losses From Dishonesty

By Dwight Ingram

MERELY putting business on the books does not put dividends in the pockets of stockholders. Most of the producer's thought is centered on making sales and completing delivery that he may have satisfied, permanent customers. But it is not enough to produce good quality material and sell it at a paper profit. Many concerns have been forced into insolvency because of a "slow pay" big account, a robbery or an embezzlement of working capital by an officer or employe. So many more firms have been seriously embarrassed by such situations that we conclude the only real profits are those which have been paid out in dividends.

Dishonesty is not a pleasant thing to talk about. Neither is it mentally healthy to worry about it. The intelligent producer will occasionally take stock of his chances of loss through dishonesty and safeguard himself either through correcting his sales and accounting methods or through insurance. Then only, can he give his whole energy to production.

There are three sources from which dishonesty can strike at the producer's profits. It may come from within the heart of his own business family, through embezzlement, forgery or theft by an employe. It may come from failure or crookedness of customers. It may come from someone in no way connected with his business through the common crimes of robbery and forgery or through bank failure. Almost all of these risks can be underwritten. The total cost of insuring adequately against all of these common risks of dishonesty is much less than the average cost of fire or workmen's compensation insurance and it is usually advantageous to delegate to an insurance company the job of safeguarding working capital and bank balances.

To say a producer needs to be on guard against money losses due to his customers requires some explanation. The non-metallic industries do not have the same simple credit problem as the retail merchant. The grocer and the tailor are dealing with scores of individuals, many of whom have no tangible assets, and the problem is so standardized that general collection rules are established and a definite

percentage of loss from bad debts can be allowed for in the selling price. In our group of industries, however, we know that railroads do go into receivership, municipalities sometimes get their funds tied up for long periods, and our private customers are subject to failure from mismanagement that is beyond our control or our ability to determine. And since our producers are dealing with fewer accounts than the grocer or tailor, the insolvency or even the "slow pay" of one large account may put a creditor in a dangerous position.

The non-metallic industries, therefore, are peculiarly in need of credit insurance, because the possibility of loss from a customer cannot be predicted on the law of averages and because the accounts are so large that the failure of one may mean bankruptcy for a producer. Credit insurance is widely carried by manufacturers; it is an old branch of the insurance profession; it is well known, but it is often misunderstood. Credit insurance does not take the place of a credit manager in a large firm or restrict the producer's control over his own accounts, because the most important part of a credit man's job is passing on the granting of credit, and no insurance company attempts to interfere with such a matter of business policy.

Credit insurance is intended to put a limit on the amount a policy holder can lose due to the insolvency, bankruptcy or "sharp shooting" financial practices of a customer. That is, regardless of business depression, financial panic, or any other cause, the policy holder has a guarantee that credit losses cannot cost him more than the amount of his annual premium.

The usual credit insurance policy contains a "deductible clause," similar to the provision so commonly known in automobile collision insurance. That is, the producer realizes he can absorb a small loss of a few hundred dollars without serious inconvenience, and he prefers to get a cheaper premium rather than to cover a risk which he can safely carry himself. Policies can be procured under practically any form which the producer wants, but the most widely used form is one under which the insured agrees to stand

the first small losses (for example, up to a total of one-half of one per cent of his gross sales), and the insurance company pays for all losses above that amount, in return for a premium of not over one-tenth of one per cent of the annual gross sales. For a producer who has gross annual sales of \$300,000, this policy would mean he would stand credit losses up to \$1,500 in the aggregate, but for a premium of \$300 a year, an insurance company would indemnify him for all losses above \$1,500. Besides guaranteeing the payment of accounts, credit insurance companies offer a service department that is preferable to a collection agency.

When an account gets so long overdue that the producer begins to worry about it, he can write a "dunning" letter to the debtor asserting that while he himself would not think of turning such a good account over to a bill collector or an attorney, he has made a contract with an insurance company under which the insurer takes over all accounts of a certain age. If such a direct letter fails to get results, the insurance company then sends out a letter stating that it is handling the credit situation in an impersonal way, and is not able to make any exceptions from its rules. Experience has shown that one or the other of these letters brings in practically all of the "slow pay" accounts, and leaves only the actually insolvent ones for the insurance company to take over. The method is more dignified than a collection agency and does not sacrifice the customer's good will. An account is not turned over to a collector until the producer is directly suspicious of it, but the customer has no grounds for hard feeling when he knows he is being treated according to a general rule and is not being singled out. The results obtained are more efficient and the cost, including the insurance premium, is less than usual with a collector or an attorney.

Losses on contracts also confront the business man. The protection of contracts through the use of contract bonds of an insurance company is now quite general. Most of the non-metallic producers are on the end of business where they have to furnish a bond to protect someone else, but whatever their relationship, the subject is important enough to warrant every man's having some technical knowledge of it. A contract bond is issued by an insurance company to

guarantee an individual or corporation that another will complete his end of a contract. The most common contract bonds are those covering construction contracts and those covering merely the furnishing of supplies. A construction contract is one where the work contracted for becomes a part of, or becomes attached to real property, when the contract in question is completed (such as the erection of a building). A supply contract is one involving merely the furnishing of material and supplies which do not become a part of the realty, or attached thereto, until after the contract in question is completed. Producers in our industries are most commonly tied up only to supply contracts, because the bulk of our business consists in delivering material into the hands of a railroad or builder, doing its own construction work. The standard rate of good insurance companies for a supply bond is \$2.50 per \$1,000. The rate for most construction contract bonds is \$15.00, but this charge carries the bond for two years, whereas the supply contract bond runs for one year or less.

Many contracts for the supply of material do not call for a single specific amount, but are continuous, fixing the terms of supply and payment for a year. The charge for a bond covering such an annual contract is one per cent on the penalty of the bond. In some cases a supply contract carries a "maintenance clause," guaranteeing the purchaser against defects or inferior quality which results in defects up to two years after the material is delivered; the addition of such a guarantee calls for a rate of \$0.625 per \$1,000 in addition to the regular rate. Where a bond has to be furnished on a bid or proposal for supplies, insurance companies charge a flat sum of \$2.50 and credit this as a payment on the final bond if the contract is awarded.

The most regrettable of losses from dishonesty are those due to employees. Most of these losses do not come from new and unknown help. Such men are not entrusted with the company funds. The most frequent losses come from bookkeepers, cashiers or treasurers who have been in a firm's employ from two to ten or fifteen years and whose integrity is never doubted. Reverses on horse races or the stock market occasionally undermine the morals of sober men, and these are the losses that can only be guarded

against by means of a fidelity bond. It is good business policy to apply for a bond for every employe having access to the company's funds or books. If the insurance company's investigation of a man turns up some flaw in his record which leads it to cancel his bond, he is the sort that it is safest to be rid of before he can start trouble. And if the practice of bonding everyone with access to blank checks, petty cash or books is followed without exception, no old employe can feel that the "boss" is suspicious of him as an individual. One might say that the less is the apparent need for a bond covering dishonesty of employes, the better it is to procure one immediately; for when there is no emergency or suspicion the bond can be put through without friction, and then the producer is protected against an unexpected loss.

The cost of bonds covering the honesty of employes is not great. The rates per \$100 for most bonded men in the non-metallic industries are as follows:

Executive officers (president, vice-president, secretary, treasurer, auditor, manager).....	\$0.35
Bookkeepers, cashiers, office clerks	.50
Bookkeeper and cashier (combined or dual position).....	.75
Drivers, collectors, salesmen, messengers .....	1.00
Paymasters, timekeepers .....	.50
Buyers, purchasing agents.....	.75

Where at least six employes of a firm are to be bonded and the total of all bonds is equal to at least \$20,000, a blanket schedule at a uniform rate of fifty cents or less for all employes can be obtained. While the insidious losses discussed above are a constant menace to prosperity, there are also some risks due to persons in no way connected with the business. There are, obviously, the crimes of violence, such as hold-up and burglary. But the most universal of these outside risks is the chance of forgery. A forgery committed by an employe who is bonded is of course protected by that bond. But a large proportion of forgeries are committed by outsiders who make it their business to learn just enough about a firm's bookkeeping and check-writing methods to put the job across. Forgeries are nearly always "inside jobs" to the extent that the perpetrator has procured one of the company's blank checks and a genuine copy of an officer's signature, or else has got a bona

fide check for a small amount and has figured out a way to raise it in spite of safety paper and protective writing systems.

The simplest form of forgery bond protects the insured against loss only through payment by the insured or his bank of any negotiable instrument (check, draft, note, bill of exchange or trade acceptance) upon which the signature has been forged, upon which an endorsement has been forged, or which shall have been raised or altered. Such a bond applies only to documents written by the insured and costs \$5.00 per \$1,000. For double this rate, a bond can be procured to cover the foregoing and also to cover the acceptance of a negotiable instrument by the insured which bears a forged signature or endorsement or which has been raised. While it is probably more important for a firm to protect itself against forgery or alteration on its own checks, the chance of forgery on checks which it accepts and puts through its bank is also quite real, and the full protection bond is most often necessary.

Many business men who believe in the value of protection against forgery do not understand the right principle of buying a bond. Some believe, for example, that the bond should be equal to the full capital of the insured firm. Others think that no one would have the nerve to try a forgery for more than a few hundred dollars and they are satisfied with a small bond. Neither of these principles is correct. What a forgery bond really protects is the current bank balance. The bond should be about as big as the largest balance that is normally carried, because obviously no check could be put through for more than this amount. Worse, though less frequent, than the chance of someone's putting through a bad check is the possibility that the bank itself may close its doors. It would not be fair to suggest that everyone ought to carry a depository bond guarding himself against loss in case of bank failure. It is a matter of personal judgment. There are many banks that are virtually "fool proof." No matter how crooked an officer might be and no matter how big a loss the stock holders might suffer, the depositors can always count on being paid in full. There are other banks, however, which are so organized that poor judgment or mismanagement on the part of the officer may

lead to insolvency. Such banks do fail, and a depositor who would like to see his bank balance guaranteed in any established bank can protect himself with a depositor's bond, costing \$5.00 per \$1,000, and written for an amount equal to what he would expect to lose in case of the bank's insolvency.

Lastly, we come to the risk of loss of money or securities through crimes of violence, such as robbery. This risk varies greatly throughout the country. Population centers like Los Angeles, Kansas City and Chicago, and every spot within fifty miles of them, are admittedly unsafe. The robbery risk runs from these high spots through many gradations down to a few poor districts where crime of this sort is almost unknown. The risk is practically within the control of the local police or sheriff, and can be regulated by public opinion directed at the law officers. How great is the risk in any given spot can be estimated by a local citizen, and our service need be only to point out that certain general principles govern this field. The first rule, of course, is not to have any cash around. A great many firms meet their pay rolls in cash because they think the men demand it. As a matter of fact, in almost every community it is possible to educate employes to accept pay checks without grumbling. When this is done, the next step in self-protection is to remove all contracts and negotiable papers or securities from the plant office and keep them in a bank vault. Bank vaults are occasionally robbed, but they are usually better than an office safe. And then finally, if it is not possible to eliminate all serious chance of loss through these preventive means, it is high time to look up the local insurance agent and ask his advice on how to cover the risk of hold-up or burglary by insurance.

When one realizes that the above paragraphs contain an almost complete catalog of the chances of business losses due to dishonesty, two final points will stand out in summary. In the first place the risks are very definite and very real and no producer is exempt from them. In the second place they are so obvious that any intelligent business man can reasonably protect himself by changing his business methods in some respects or by turning the most unavoidable risks over to an insurance company.

### H. W. Blocksom Dies

Horace W. Blocksom, sales manager for the Wasem Plaster Company and one of the best known plaster men in the middle west died at Mercy Hospital, Fort Dodge, Iowa, early Christmas morning. He was taken ill suddenly Christmas eve with a stroke of apoplexy while entertaining friends in his hotel apartment and never regained consciousness.

Mr. Blocksom was born in Zanesville, Ohio, November 28, 1868. For twenty-five years has been selling gypsum products, taking his position with the Wasem Plaster Company in 1912. He is survived by one son, Horace W. Blocksom of Boston, Massachusetts.

Funeral services were held the Sunday after Christmas and the body was taken to Zanesville, Ohio, for burial and was accompanied there by a representative of the Wasem Plaster Company. A number of gypsum men from the central west attended the services.

### Hercules Motors Plans Additions

An expansion program of great proportions, including not only a large additional building to the present plant, but noteworthy additions to the sales and advertising programs have today been announced by the directors of Hercules Motors Corporation, Canton, Ohio.

During the past several years the unprecedented demand for Hercules Engines and Hercules Power Units in the ramifications of American industry has kept the present large plant filled to its capacity. The addition to the former line of two larger engines, Models "TX" and "TXA" of respectively 75 h.p. and 100 h.p., has made the building program imperative to afford proper production facilities. Meanwhile, the demand for the Hercules four-cylinder engine in automotive work has greatly increased.

The new addition, construction of which will begin immediately, will contain 14,000 square feet of floor space. Additional machinery and equipment have already been purchased.

The former directors and officers have been re-elected as follows: H. H. Timken, president, Timken Roller Bearing Co., chairman of the board; E. H. Langenbach, president, United Alloy Steel Corp., president; Charles Balough, vice-president and general manager; H. P. Blake, secretary.

# Character and Uses of Babbitt Metals

By L. D. Allen

Bearing Specialist and Metal Manufacturer

**B**ABBITT metals are composed of tin, lead, antimony, copper and sometimes in very small quantities of bismuth, aluminum and certain other metallic and chemical combining fluxes and ingredients.

We divide babbitts into three classes, namely:

- Tin-based
- Semi-tin-based
- Lead-based.

The tin-based babbitts contain from 70 to 90 per cent tin, remainder lead, copper and antimony. Usually no lead is used in babbitts with above 85 per

cent tin. Recent tests, however, have proven that a little lead added to a tin-based babbitt improves both its load carrying and anti-frictional properties. Tin-based babbitts are of a whitish yellow appearance. Where they are lower in tin and contain 10 to 15 per cent antimony, they show a fracture or grain. The yellow and sometimes purple surface color is an indication of their copper content.

	Melts Fahrenheit	Specific Gravity	
Tin .....	450	7.28	Tin being a dry metal is not anti-frictional. It toughens and hardens a babbitt but lowers the melting point. Also acts as a solder to bind the antimony and lead into a more cohesive body.
Bismuth .....	520	9.80	Lowers the melting point of a babbitt and assists in cementing and closing the fracture.
Lead .....	621	11.35	Imparts cool running or anti-frictional properties. Too soft to use alone.
Antimony .....	1166	6.80	Hardens a babbitt, but if used in excess makes it brittle. It is anti-frictional.
Copper .....	1981	8.90	Hardens and toughens a babbitt not anti-frictional; used in small quantities only. Does not mix well with lead.

cent tin. Recent tests, however, have proven that a little lead added to a tin-based babbitt improves both its load carrying and anti-frictional properties. Tin-based babbitts are of a whitish yellow appearance. Where they are lower in tin and contain 10 to 15 per cent antimony, they show a fracture or grain. The yellow and sometimes purple surface color is an indication of their copper content.

The semi-tin-based metals range from 30 to 60 per cent tin. The variety is the result more of selling expediency than of bearing requirements. They are of a white-yellow appearance and show a considerable fracture or grain. The fracture is more bluish in color than that in the high tin-based babbitts.

The lead-based metals range from no tin to say, 20 per cent tin content, balance being lead, antimony and copper. They are the best anti-frictional metals, carry heavy loads but are not tough or cohesive with respect to standing pounds, vibrations and unusual bearing stress. Also the

class of materials and method of manufacture have much to do with their load carrying strength. In service babbitt metals are for the purpose of meeting all requirements divided into three classes, but for general, practical purposes, two classes, namely, General Purpose Babbitt and Extreme Service Babbitt.

The General Purpose Babbitt should be a lead-based metal specially processed and alloyed for all around, general purpose babbitting requirements, where constant or even speed and pressure conditions prevail. For

average to high speed low pressure bearings, or for fairly heavy duty bearing with average speed. Stands an unusually heavy load where bearing liners are  $\frac{1}{4}$ ,  $\frac{3}{8}$  or  $\frac{1}{2}$  in. in thickness, not intended for bearings subject to pound, unusual strain, nor for thin-shelled liners subject to more or less vibration and stress. Extensively used for general purposes in brick, fertilizer plants, coal mines, line shaft bearings, cotton gins and oil mill machinery, silk, woolen and laundry machinery, woodworking plants, pneumatic tools, condensers, evaporators, exhaust fans, pressure blowers, loose pulleys, centrifugal pumps, slide-valve engines, main bearings in traction, portable engines and steam hoists, dredging machinery, etc.

Extreme Service Babbitt should be a tin-based metal processed and alloyed for bearings subject to extreme speed and pressure conditions, pounds, shocks and vibrations; bearings of high powered generators, armatures, turbines; for main and crank pin bear-

ings, or for fairly heavy duty bearing with average speed. Stands an unusually heavy load where bearing liners are  $\frac{1}{4}$ ,  $\frac{3}{8}$  or  $\frac{1}{2}$  in. in thickness, not intended for bearings subject to pound, unusual strain, nor for thin-shelled liners subject to more or less vibration and stress. Extensively used for general purposes in brick, fertilizer plants, coal mines, line shaft bearings, cotton gins and oil mill machinery, silk, woolen and laundry machinery, woodworking plants, pneumatic tools, condensers, evaporators, exhaust fans, pressure blowers, loose pulleys, centrifugal pumps, slide-valve engines, main bearings in traction, portable engines and steam hoists, dredging machinery, etc.

Extreme Service Babbitt should be a tin-based metal processed and alloyed for bearings subject to extreme speed and pressure conditions, pounds, shocks and vibrations; bearings of high powered generators, armatures, turbines; for main and crank pin bear-

ings of high powered engines, hard rock crushers, etc.

Speed is seldom a factor in the use of a babbitt metal. It is the load, vibration, pound and general stress conditions that tell on a babbitt and cause bearing failure.

Softness and brittleness, or lack of body and strength are the most common causes of bearing troubles. The liner crushes or cracks and crumbles out, necessitating a shut-down and reabbtting expense of many times more than the cost of the babbitt. When the metal is too soft, it is too low in tin, copper and antimony; when it is too brittle, it is too low in tin and too high in antimony.

The requisites for a satisfactory liner are that it be efficiently dense and compact in structure to carry the maximum shaft or journal load, that it be cohesive in its body so as to resist cracking or crumbling under likely journal pound or vibration, that it be composed of materials showing the least resistance to friction and for producing a smooth, mirror-like bearing surface. Load and pressure resisting strength require a cohesive compact bodied metal, and instead of attempting to secure this hardness and strength solely through the use of antimony, as is common in many bearing metals, it should be secured through the use of the more costly ingredients, such as tin and copper.

### Erwin Feldspar Sold

Herber P. Margerum of Trenton, New Jersey, recently purchased the holdings of the Erwin Feldspar Company, Incorporated, and will become the active head of the organization. The property of the Erwin Company includes the grinding mills at Erwin, Tennessee, along with ten thousand acres of feldspar land located in Avery, Mitchell and Yancey Counties, North Carolina, embracing the largest developed feldspar mines in this country.

Mr. Margerum is president of Golding Sons Company, producers of pottery, tile, sanitary and porcelain manufacturers' supplies, thus bringing together under his direction the two largest companies in the United States. The changes recently made in the Erwin Company places it in a strong financial position enabling it to improve its already well developed facilities for rendering service of the highest type.

The potential clay, feldspar, French flint and Cornwall Stone resources of these companies are practically unlimited. These combined with the well equipped, well designed and strategically located mines and mills, the mills having a grinding capacity of 250 tons of spar per day insures the consumers of this material of uniformity and prompt deliveries in large or small quantities.

Mr. Margerum brings to his new organization the vision, experience, ability and influence of a seasoned executive. The acquisition of these properties places them on a level commensurate with their important standing in the production of finished products.

In acquiring the Erwin Feldspar Company Mr. Margerum takes over an organization well drilled and experienced in the mining and grinding of feldspar. One that is thoroughly alive and awake to the many ramifications of the business. An enthusiastic personnel who have faith in the future of the business and measures the growth only by the limit of the expansion of the many branches of the ceramic industry. Their purpose to serve and render a real service has made them a host of friends. Added to this, the maintenance of the recognized high standard of the finished products places the company in an enviable position. This loyal enthusiastic organization welcomes their new leader and will put forth greater effort in order to fulfil their responsibility to both Mr. Margerum and to the trade in general.

Mr. Margerum realizing the necessity of giving the consumers of ceramic materials the greatest service in supplying standardized uniform products including Cornwall Stone, French flint, American flint, china clays, ball clays, sagger clays and feldspar from the producing sections in Canada and New England to Georgia inclusive, prompted him to bring under his direction these properties.

Since January 1, the general offices as well as the main selling office has been located in the Trenton Trust Company building in Trenton, New Jersey. Branch selling offices will be opened at such points and at such times as the business warrants.

A Structolite plan book has been prepared for distribution by the United States Gypsum Company, which suggests designs and uses of one of their products.

# The Development of Earth Roads

By S. S. Steinburg

Highway Research Board, National Research Council\*

**H**IGHWAY engineers have long felt the need of a type of road surface that would serve for secondary or local traffic and yet be low in first cost and maintenance. Though considerable has been accomplished in the development of the higher type surfaces for use on main traffic roads, comparatively little progress has been made in the methods for improving secondary or natural soil roads, which constitute about eighty-five per cent of the total road mileage in the United States. In their present unimproved condition the local roads cannot function properly as feeders to the main routes, thus depriving considerable areas and great numbers of individuals of the benefits of those portions of our highway transportation system already completed.

In view of the enormous mileage of local roads and the comparatively small amount of traffic upon them, it is evident that for many years to come it will be economically impossible to surface all these roads with the more costly types of pavements.

Realizing this fact, the state highway departments and the universities have conducted experiments for the purpose of stabilizing and protecting the surface of earth roads. These have included soil selection methods, bituminous treatments, chemical treatments, and veneer-macadam.

The objects of this investigation are to coordinate the efforts and data already available on the improvement of earth roads and to simulate further research in order to find an inexpensive road surface to carry intermediate traffic. It is recognized that no single answer to this problem would serve the entire country, but that due to differences in soil and climatic conditions the solutions will be matters affected by geography and geology. It is also felt that a proper solution may need to take into account the chemistry of the road itself, a field of research as yet untouched, but one which may help solve not only the earth road problem but also many of

the subgrade difficulties encountered in the use of the more costly surfaces.

The writer's connection with this investigation has been a temporary one, and the study thus far has been preliminary and chiefly for the purpose of assembling and correlating all available information of completed, current and proposed research on earth road treatments. No field inspections have yet been made, but the material assembled will enable the investigator to study effectively.

Thus far the following work has been done:

1. Statistical material has been collected for determining the mileage of and expenditure on earth roads in the states.

2. Through the kindness of the Chief Bibliographer of the Library of Congress, and with the aid of the U. S. Bureau of Public Roads, a bibliography on earth roads and earth road treatments has been prepared.

3. A search has been made in the Patent Office of all patents granted on earth road treatments of which about a hundred have been assembled.

4. Information has been gathered of research on earth roads now under way in various states and by universities.

5. Through the state contact men of the Highway Research Board information has been secured as to methods of earth road treatment now in use in the states.

6. By correspondence and conferences interest in the earth road problem has been aroused among highway engineers and researchers.

7. By radio talks and by articles in the press, the attention of the public has been called to the importance of the present investigation.

A summary bulletin of the fifth annual meeting of the Highway Research Board is ready for distribution by the division of engineering and industrial research of the National Research Council of Washington, D. C. Application for both this summary and the complete report of the proceedings should be sent to the Highway Research Board, National Research Council at Washington, D. C.

\*Presented at Fifth Annual Meeting, Highway Research Board of the National Research Council at Washington, D. C., Dec. 3 and 4, 1925.

## Cold Weather Tests Made on Mortars

**T**ESTS recently conducted at the University of Wisconsin, under the direction of the Engineering Society of that state, demonstrated that lime-cement mortars are most satisfactory for use in cold weather. Eight lime and portland cement mixes and four brick-layers cements were tested under air storage conditions which approximated ordinary field construction curing conditions.

Mortar mixed in the proportion of 1 part of portland cement, 2 parts of lime, and 9 parts of sand by volume gave uniform satisfaction under both warm and cold storage conditions and had a high rating in shear, tensile and compressive strength. The high plasticity of this mix also played an important role in its selection as first on the list of mortars recommended by the committee.

The conclusions drawn by the committee in charge of this work are:

1. With all cements save one, freezing decreased the bond strength of the mortar to the brick. In most cases this decrease was very marked. In the exceptional case, where there was no apparent injury due to freezing the bond strength after curing in warm or freezing temperatures was very low.

2. Curing at low temperatures just above the freezing point of water adversely affected the bond strength to a less extent than during under freezing temperatures.

3. Basing judgment on the unit stress at flaking of mortar, it appears that curing at temperatures near the freezing point had little effect on the crushing strength of the mortar in the bonded brick. On the other hand, freezing appears to have had a weakening effect on the crushing strength.

4. From the above evidence it appears that freezing is detrimental to the strength of mortars which are commonly used in bricklaying.

5. From the standpoint of strength the mortars given in the table give the best results. The figures represent any unit of volume:

Cement	Hyd. Lime	Sand
1	2	9
1	1	6
2	1	9
Cement	Q. Lime Paste	Sand
1	2.3	6.7
1	2.3	10
1	1.5	5
1	1.5	7.5
1	—	3

Of these mixes those containing 1 volume of cement to 2 volumes of lime (hydrate or paste) to 9 volumes of sand are the most economical. Mixes containing equal volumes of cement and hydrate (or paste) though somewhat more costly were stronger especially at one month.

6. Mixtures of lime and portland cement were much more plastic and easier to work than the mortar made with portland cement and sand. The mixtures containing equal parts of hydrated lime and portland cement and one part hydrated lime to two parts portland cement exhibited considerably higher adhesion to the brick than the portland cement mortar.

## Foos Diesel Engine

The Foos Diesel engine, a product of the Foos Gas Engine Company, embodies certain features of design which the manufacturers claim make it particularly applicable to the cement and crushed stone industries.

The possibilities of completely safeguarding the engine against the harmful effects of dust and dirt by the installation of an air filter is the feature emphasized by the manufacturer. The lower part of the cam shaft housing has been ingeniously utilized to enclose the air inlet header. This header running full length of the engine is closed at the governor end and is carried a few inches beyond the last cylinder frame at the fly wheel end. The header opening is provided with a flange to which may be bolted air piping in case the air is to be taken from a remote point within or outside the engine room. A short length of pipe may be used for mounting an air filter.

Certain difficulties are frequently encountered in equipping some engines of the older A frame type and still others of the newer box frame design with air headers where it is necessary to filter the ingoing air. Arranging the air inlet header underneath the cam shaft housing as in the case of the Foos design leaves the top of the engine free from obstructions.

The McCall Sand & Gravel Company, Bennettsville, S. C., Capital, \$50,000. Officers: D. K. McColl, C. E. Townsend.



# Industrial Standardization During 1925

By C. E. Skinner

Chairman, American Engineering Standards Committee

THE past year has shown important developments in the growth of the industrial standardization movement. One of the most important of these has been the increase of active interest on the part of industrial executives. A conference of first-line executives, held early in the year, organized a committee from their number to serve as an advisory committee to the American Engineering Standards Committee, and these men are now giving time and assistance to the solving of national standardization problems. Formerly, the matter of standardization has been left largely to the technical man, but it is now generally recognized that standardization is a managerial problem of the first rank.

Of special interest to the factory owner and manager is the Directory of Specifications, published in August, 1925, by the Department of Commerce. This compilation lists approximately 27,000 existing specifications covering 6,000 commodities, and it will be found very useful in connection with purchases. The astonishing multiplicity of specifications on the same subject has brought sharply forward the problem of unifying them into consistent groups. Such unification is an industrial and economic problem of the first importance.

In so brief a review the standardization activities of the hundreds of organizations, trade, technical and governmental, cannot be listed. However, the work of the American Engineering Standards Committee is typical of the standardization movement as a whole, since the Committee acts as a general clearing house, and each project promulgated under its auspices represents the combined effort of many such organizations.

The list of projects now before the A. E. S. C., at various stages of development, totals 218, including 76 approved standards. Notable progress has been made during 1925 in the completion or further development of many of these projects. The number of projects of each industry represented in this work, through 250 national organizations, is as follows: Civil Engineering and the building trades, 35; mechanical engineering,

63; electrical engineering, 32; automotive (automobile and aircraft), 4; transportation, 9; ship-building, 1; ferrous metallurgy, 9; non-ferrous metallurgy, 15; chemical industry, 12; textile industry, 3; mining, 16; wood industry, 5; pulp and paper industry, 1; miscellaneous, 13.

In the field of mechanical engineering, a system of limit gaging, together with a comprehensive scheme of fits, which is probably the most important project ever carried through by the American Engineering Standards Committee, lays the basis for the carrying out of complete interchangeable manufacture on a national scale, as well as for facilitating mass production within the individual factory. When this work permeates the structure of American manufacturing industry, the resulting savings will run into enormous figures. Two important dimensional standards, dealing with cold-finished shafting, and square and flat shafting keys, have also been approved.

At a conference in December a comprehensive program for the standardization of drafting room practice was launched. There has been great interest in this subject and it bids fair to become a matter of first importance on account of the wide range of industries which it affects. Although many individual factories have already worked on the standardization of drafting room practice, we are on the whole far behind European countries in bringing about the economies which are possible through national standards.

In the electrical field, the 1925 edition of the National Electrical Code, the bible of the electrical wiring industry, has been approved. Also a system of connections and markings for electric power apparatus, representing the combined effort of a large number of engineers, has been approved as American Standard, after standing the test of several years practical application on a large scale. A standard for instrument transformers has been recommended for approval, and a standard for synchronous converters has also been submitted.

For the first time complete national agreement has been reached on a

Safety Code for Aeronautics, in the development of which the military and civil branches of the Federal Government and the commercial and public agencies interested in the subject were represented. The code deals with standards of safety for design, construction, testing and operation of aircraft. Good progress has been made in the code for automobile brakes and brake testing.

The mining industry is the most recent of the great industries to take up standardization on a comprehensive scale. The leaders in the movement have been the U. S. Bureau of Mines and the American Mining Congress. In addition to the 16 standardization projects now under way, under the procedure of the A. E. S. C., 3 more have been officially proposed. A notable step in the prevention of mine explosions has been the completion of a code for rock dusting of coal mines, through the cooperative effort of all interested groups. Catastrophies due to coal mine explosions can be prevented by the simple expedient of spreading rock-dust thickly enough to cause an incipient coal-dust explosion to die out rather than to travel through the mine atmosphere.

In the field of industrial safety, satisfactory progress has been made on a program of some 40 codes, most of which are applicable to factories. Seventeen of these have been completed, and work on half of the remainder is well advanced. Codes for paper and pulp mills, and elevators and escalators, were completed and approved during the year.

The fourth year of the work of Mr. Hoover's Division of Simplified Practice has shown even more rapid development than heretofore. In all, 39 simplifications have already been carried through, 10 others are in the final stages, and 65 additional surveys are now under way. Over two hundred industrial groups are cooperating in the various projects.

Approximately 350 specifications have been promulgated by the Federal Specifications Board, which means that these specifications have been unified as between the various branches of the Government. A leading part in this work is being taken by the Bureau of Standards, the Director of the Bureau being ex-officio chairman of the board.

Standardization on an international scale is still in its infancy; yet through the cooperation of the various national standardizing bodies there

has been real accomplishment in several subjects. Of special interest, on account of its relation to the use of specifications in the development of foreign trade, is the First Pan American Conference on the Uniformity of Specifications, which was held in the first part of January, 1925, in Lima, Peru. It was decided to hold another such conference in the United States within a year or two. In connection with the meeting of the International Electrotechnical Commission which is to be held in New York in April, 1926, there will also be held in New York a conference of the chairmen and secretaries of the national standardizing bodies, for which the American Engineering Standards Committee will act as host.

With some important exceptions, manufacturers generally have carried on their standardization work as a more or less incidental part of their engineering and production activities. But thorough-going standardization simplifies and clarifies every step in the work of the manufacturer from the solicitation of the order to the mailing of the receipted bill. Definite organization for standardization work within companies has thus become a pressing managerial problem.

Another special problem on which marked progress should be made during the coming year is to get organizations of distributors to play their proper role in the standardization movement. It is generally recognized that the most important industrial and economic wastes are in the field of distribution, and that broad programs of standardization are essential to the elimination of this waste. Mr. Hoover, for example, rates standardization as second only to statistics in its importance in the whole distribution problem.

### George Kirkham Retires

George Kirkham, sales agent for the American Steel & Wire Company, retired, December 31st. Mr. Kirkham came to the American Steel & Wire Company when the Washburn and Moen Manufacturing Company of Worcester, Massachusetts, was taken over by the former concern, twenty-seven years ago. He was an expert in the intricacies of fine wire products in the old company and continued in that line until 1902 when he was established as sales agent at Memphis, Tennessee, handling both merchant trade and manufacturing lines.

## Conditions in Magic Valley

**L**YING a little ways north of the Rio Grande is a range of low hills yielding gravel which is doing its part in changing the semi-arid delta of the river to a perennially fertile field of citrus fruit and vegetables. The delta of the Rio Grande comprises some 3,000 square miles in the state of Texas in the counties of Hidalgo and Cameron. The region lies adjacent to the Republic of Mexico and to the Gulf of Mexico. Within the past few years it has become one of the most intensively farmed sections of the United States, sending thousands of carloads of fruit and vegetables northward annually. But quantities of water, has always been the problem of the region. Lack of water has hindered every development and although progress has been made in irrigation, a new day seems to be dawning, due to the use of gravel and cement. Now some 230,000 acres are receiving water through pumps from the Rio Grande. Some farmers pump individually with eight or ten inch pumps and laterals, but some of the organized districts own gigantic stations furnishing a full flow through fifty to 100 foot bottom ditches.

Recently the irrigation engineers of the locality have reached a unified vision of the vast system of irrigation ditches being lined with concrete thereby eliminating the tremendous loss of seepage of the precious water. Some of these concrete lined canals are now being put in in the vicinity of Brownsville, Texas. Their extension all over the valley region is considered but a matter of time, for it has been proved their cost is trivial in comparison with the magnitude of water conservation problem. The hills from which the gravel is obtained lie from one to three miles back from the river. The gravel is hard and of good quality for concrete when properly cleaned, running a very small percentage of oversize and necessitating but little crushing. The higher hills almost invariably contain a hard concrete of natural cement and the gravel obtained from them makes wonderful railroad ballast or base for highway construction. The pit run formations usually contain about 60 per cent gravel and 40 per cent caliche binder. In these hills it is hard to obtain a good quality of concrete gravel because the caliche balls are

retained in the gravel by the screens. Certain deposits along the toe of the range of hills, which usually require from one to three feet of stripping, are loose enough to be worked without shooting and from them is obtained the bulk of the concrete gravel. These deposits run from 40 to 65 per cent.

Four firms are working in this territory. J. A. Card, the La Joya Gravel Company, the Havana Gravel Company, and the Valley Rock and Gravel Company. All of these have their offices at Mission, Texas. Operators in this section have extremely low labor costs. In the early days of the industry in the section, those of wayside pits and hand-screens, and team transportation to the nearest sidetrack, Mexican labor could be obtained for 65 cents for a ten hour day. Mexican labor is still employed almost exclusively but the rate now has advanced to \$1.50 or \$1.75 for a ten hour day for labor. Due to the fact that the pits are located just outside the gulf area and are not adjacent to cities of any size, practically no trucking is done. All of the gravel is loaded on railroad cars. The abundance of cheap labor probably had a hand in holding back the mechanical developments in this field. At one time wheelbarrows were employed to transport the material in the case of screen gravel, to the elevator hoppers and to take pit run direct to railroad cars.

The Gulf Coast lines which were recently purchased by the Missouri Pacific system, serve the pit operators of the territory. The railroad built sidings to the pits as soon as production justified it. During the decade ending with 1920, the population of the section increased 154 per cent and it is believed that this rate has increased annually since that time. The production of high priced winter vegetables and citrus fruit, together with a ten to twenty million dollar summer crop of cotton, corn, etc., has made for high values and created a desire for more development. Money is being lavishly expended in building everything desired by a luxury loving modern public. In Cameron and Hidalgo counties, 140 miles of hard surface highways have been built during the last two years. These roads have taken the gravel produced by the pits

in the western part of Hidalgo county in the vicinity of Penitas and Sam Fordyce. Every county or city bond issue, every new structure from the private home, schools, churches, hospitals and hotels, every new irrigation canal, adds to the business of the gravel producer.

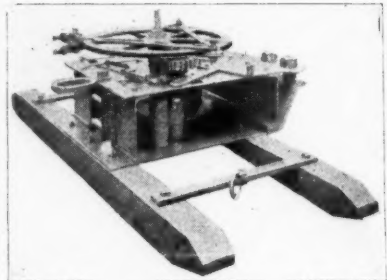
The four concerns mentioned in this article have trackage to their pits and modern loading facilities for both pit run and screen gravel. As no electric power is available, all are using gasoline engines. Due to the scarcity of water and the knowledge that the supply is never constant, the pits all use the dry method of screening. Both bucket and hill elevators are used and rotary screens are universal. Due to the limited yardage in each deposit and the physical nature of the deposit, all are small having a capacity of from 100 to 200 yards of screen gravel and from 200 to 300 yards of pit run gravel a day. None of the plants work to capacity the year around although they are never forced to shut down because of cold weather. Occasionally operations are stopped by heavy rains.

Various methods of transporting materials from nature's beds to the cars have been employed including steam, gasoline, drag scraper and steam shovels. At present all the pits are using mules and fresnos for delivering material, either directly to the elevator hoppers or to the industrial cars which in turn carry the product to the hoppers. No storage bins are used and all gravel goes directly to the cars. This is due to the fact that the deposits are comparatively small and regardless of the test pits sunk, it is uncertain until they are worked out. This, of course, necessitates many movements. Most of the pits are using double tracks, one for gravel and one directly under the screens for screening. A market is found with the railroad for the surplus screening which cannot be advantageously disposed of for street topping, driveways, etc. No sand of desirable quality for cement has been located in the valley. Sand for concrete is shipped in from up-state at very high freight rates. Some operators believe a very good coarse sand could be economically obtained by working the dust and quicksand from the screenings, but no attempt has been made to do this so far.

### Handy Andy Pulling Machines

The John Waldron Corporation has put on the market two pulling machines for all sorts of moving and lifting jobs. They are known as the Handy Andy, Junior, and Senior. The former is a man power machine capable of moving loads up to forty tons and the latter is designed for horse, truck or tractor power. They are of interest to pit and quarry operators and plant owners chiefly for their efficiency as car spotters.

The Senior puller, the manufacturers claim, is limited as to capacity only by the strength of a one-inch wire cable. By the use of two blocks a pull of from 75 to 100 tons can be made. The Junior puller is a compact unit built on the same principle of operation as a lifting jack and it operates in the same manner. It is of all steel construction, the frame is of one piece and has a sixty foot blue center steel drum line as standard equipment.



Handy Andy, Sr.

It works in any position on the ground and will ride in the air on the cables when a heavy pull is put on it. It is fitted with an automatic reverse which enables a man to lift a load in the air and lower it again, a great advantage when the machine is used as a hoist. The machine is made with two speeds and has a five foot steel operating bar.

### Browning Crane Open New Branch

The Browning Crane Company of Cleveland, Ohio, manufacturers of Browning locomotive cranes and buckets, have recently opened a new branch office in Pittsburgh, Pennsylvania. The establishing of this office is in conformity with the Browning policy of maintaining direct factory branches in industrial centers to better service locomotive crane users.

## New Record Set by 1926 Road Show

**C**HICAGO was the loadstone of road builders this week. Drawn by the magic power of the 1926 Road Show and the meetings of the American Road Builders Association, producers, engineers, contractors, equipment manufacturers and the others who go to make up this gigantic industry flocked to the city 20,000 strong.

The show, held at the Coliseum from January 11th to 15th, was more colorful than any of the great displays of previous years. Exhibitors of machinery painted their products in bright colors and decorated their booths to catch the eye of the visitors.

The broad sweep of roof which spans the hall famous as the nominating hall of many presidents, was a mass of American flags. The display of road machinery equipment and materials this year excelled any exhibit of the kind ever held in the world, those in a position to know report.

William H. Connell, president of the American Road Builders' Association, opened the general session Tuesday morning in the Gold room of the Congress hotel. In his remarks, Mr. Connell pointed out the magnitude of the highway industries and the possibilities before them.

"In the twenty-three years that the American Road Builders have been holding conventions," said Mr. Connell, "the attendance has grown from about 250 in 1903 to approximately 20,000 at the 1925 convention. This indicates the growth of this industry that now ranks as one of the biggest in the world, and when we consider that there are about 3,000,000 miles of roads in the United States and only 430,000 miles of which are surfaced with gravel, or better, it is evident that this business is still in its infancy. While the expenditures probably will not increase in the same proportion as they have since the close of the World War, the additional mileage of hard-surfaced roads necessary to meet the highway transportation demands will result in a substantial increase in the highway expenditures each year for an indefinite time.

"I say this because if the time ever arrives when all the highways will have been paved, there still will be the up-keep problem, in which is included not only the maintenance repairs but the replacement of a con-

siderable mileage of these pavements each year made necessary by deterioration, which is inevitably due to the wear and tear caused by the traffic. Pavements are like everything else. Their lives can be prolonged through wisely administering to their needs in the form of making the necessary repairs by applying the theory 'A stitch in time saves nine,' but they eventually serve their time and when the cost of repairs to keep them in



H. G. Shirley, Elected President A.R.B.A.

proper condition to meet the traffic needs becomes so excessive that the annual charge exceeds the interest and sinking fund on the capital outlay and the maintenance cost of a new pavement, it is, of course, good business to replace the worn-out pavements with new ones. This process will go on to the end of time. Sometimes these replacements are made necessary in a shorter period of years than was anticipated due to a change in traffic conditions, but they are inevitable as it would not be sound from an economic standpoint, even if it were possible to go to the expense of building today for the next ten generations or so, as the cost would be prohibitive or it would only be possible to complete about a few hundred

miles of new hard-surfaced roads each year as compared with about 12,000 miles that were actually completed during 1925, all of which were very much needed.

"There is an accepted principle that no highway shall be constructed at a cost in excess of its earning capacity. There can be developed from the facts evolved from transport surveys, such as the one made in Pennsylvania, whether or not there is a definite return to the public in dollars and cents on any section of highway just as the return in dollars and cents can be shown on a section of railroad. The only difference is that the railroad's earning capacity is based on charging certain sums for transportation commodities and passengers, while the paved highway's earning capacity is based on saving definite sums to the people using the highways for transporting commodities and passengers. In the case of both the State of Pennsylvania and the entire United States the building of improved roads has saved the owners of motor vehicles many million dollars in excess of the annual costs of the roads.

"This saving in motor vehicle operating costs, both for Pennsylvania and the entire United States, exceeds the annual cost of the improved highways. The average cost of durable type construction in Pennsylvania is about \$50,000 a mile. The annual cost for each mile of road constructed, including interest and sinking fund on the capital outlay, plus the annual maintenance charge, is about \$4,800 per mile, or \$21,600,000 for 4,500 miles. The construction of these roads also saved the annual maintenance charge of \$2,250,000 for the 4,500 miles of dirt roads which have been replaced. Therefore, the additional annual charge due to the construction is only \$19,350,000. Deducting this from saving in operating costs of \$51,750,000, leaves a net annual saving of \$32,400,000.

The average cost of the several types of hard surface road construction in the United States is about \$33,200 a mile and of gravel roads about \$10,000 a mile, based on costs on the federal-aid system from 1917 to 1925. The annual cost for each mile of hard-surfaced road constructed, including interest and sinking fund on the capital outlay, plus the annual maintenance charge, is about \$3,350, or about \$446,000,000 for 133,196 miles, for the gravel roads it is

about \$2,000 per mile, or \$305,000,000 for 153,000 miles, making a total of \$751,000,000 annual charge for the hard-surfaced and gravel roads. The maintenance costs that have been used for the different classes of roads in the United States are based on the maintenance costs for similar roads in Pennsylvania for the traffic of 700 vehicles a day that has been assumed for the United States. The construction of these roads also saved the annual maintenance charge of \$143,000,000 for the 286,000 miles of dirt roads which have been replaced. Therefore, the additional annual charge due to the construction is only \$608,000,000. Deducting this from the saving in operating costs of \$1,630,000,000, leaves a net annual saving of \$1,022,000,000.

"The figures for the entire United States show that while the owners of motor vehicles save annually \$1,630,000,000 in operating costs due to the construction of 286,000 miles of gravel and hard-surfaced roads, they only paid \$420,000,000 in 1925 in motor vehicles registration fees and gasoline taxes, leaving them a net saving of \$1,210,000,000.

"There is no need of my trying to impress you further with the fact that the business of this industry is going to show a very considerable increase each year because highway transportation has come to stay, unless we all take to the air. While nothing seems to be impossible, I think that you will all agree that even though there will be great progress made in aerial transportation, it will not curtail the increase in highway work each year."

Governor Len Small of Illinois welcomed the delegates on behalf of the State of Illinois. During the course of his remarks he referred to the road program for Illinois:

"We are now letting the few remaining contracts required for completing the \$60,000,000 bond issue system, and during this year we hope and fully expect to start work on the new roads, and every effort will be made to complete at least 1,000 miles of durable, hard surfaced pavements during the year 1926. Within the next three or four years we expect to have completed with a durable hard surface not less than 18 feet in width a system of at least 8,000 miles of State trunk highways."

"The development of highway transportation has already had a tremendous effect on railway transporta-

tion," President Markham of the Illinois Central Railroad said. "In the last five years there has been a steady decline in the total number of passengers carried by the railroads."

"At the beginning of the twentieth century there was scarcely a mile of hard-surfaced highway in the United States. Now there are approximately half a million miles, and we are spending nearly a billion dollars a year on the construction and maintenance of public roads. In 1900 there were eight thousand motor vehicles in use in this country. By 1924 the number had reached seventeen and one-half million; 4,325,000 were produced in 1925, and at present there are more than twenty million in use.

"It is impossible to determine which is cause and which is effect in considering the parallel development of good roads and motor vehicles. Each increase in the number of automobiles in use adds to the demand for improved highways, and every addition to the mileage of improved highways increases the field of usefulness of automobiles. The result of the great increase in both motor vehicles and good roads since 1900 has been the development of highway transportation far beyond the limits anyone thought possible twenty-five years ago.

"This development of highway transportation has proved its great value in all life's activities. It has helped to abolish rural isolation and urban provincialism. It has made good schools and other refining influences of civilization more widely available. It has aided in the development of rural mail and parcel post service. It has reduced the cost of moving farm products to railway shipping points and the cost of moving goods consumed on the farms from railway shipping points. It has provided outdoor recreation for millions of our population. In short, it has helped tremendously to transform the living conditions, the thought, the culture and the very lives of the American people.

"Highway transportation has created problems as well as benefits. Each form of transportation has its individual characteristics. Our national transportation program should take these characteristics into account and assign each form of transportation to that field in which it can reach its maximum efficiency and be of greatest use in the public service.

Unless that is done, there is certain to be wasteful conflict. Therefore, I think it is important that we determine clearly the field to which highway transportation ought to be assigned in our program for the continued development of transportation as a whole.

"As far as railroads and motor vehicles are concerned, it seems to me, the problem is one of co-ordination rather than one of competition. In some instances motor vehicles operated over good roads are capable of furnishing transportation to better advantage than railroads, and in those instances the railroads must in time give way. On the other hand, there are certain transportation services that can be furnished to better advantage by railroads, and in those services the railroads must dominate. Economic law is inexorable; in the end, that means of transportation will prevail which is best suited to perform the service required. However, the interest of the public in good transportation now and at all times makes it advisable that we anticipate the effect of economic law and so curtail the period of uneconomical and possibly injurious experiment.

"The development of highway transportation has already had a tremendous effect on railway passenger transportation. In the last five years there has been a steady decline in the total number of passengers carried by the railroads. Long-distance travel and commutation travel on the railroads have been increasing; hence all the loss has come about in travel between nearby points. This loss has been due almost altogether to the increasing use of automobiles on good roads.

"No system of public transportation, in my opinion, can successfully compete for this business with the private passenger automobile. It is too much to expect a man with an automobile at his doorstep to go to a station, wait for a train, pay a fare, stop at places he has no interest in and adjust his movements generally to a train schedule when he has the alternative of good roads to travel on, every liberty as to time of departure and return, a motoring expense that seems negligible to him and a vehicle for his use when he arrives at his destination. It is not a question of cost. It can be demonstrated that the cost per mile is much greater for automobile travel than for train

travel, when depreciation and interest on investment are figured in. But who can sway the average American by arguing for economy against convenience?

"The increased use of private automobiles over good roads has made it unprofitable for the railroads to operate many of their local passenger trains. In some sections local passenger train service already has been considerably curtailed. More local passenger trains will have to come off from time to time. The discontinuance of these trains means some hardship, even as little used as they have come to be. Local express and mail service is inconvenienced, and the trains are missed in bad weather. The public must take these inconveniences into account in making its decision as to whether it needs local passenger train service strongly enough to make such business profitable to the railroads. If it doesn't, the railroads have no alternative but to quit running the trains.

"In considering the effect of the development of highway transportation on the railroads, we should keep in mind the fact that the railroads handle an enormous volume of freight traffic as a direct result of the development of highway transportation. There are approximately three million miles of highway in this country, of which about half a million miles are hard surfaced. Practically all the road-making machinery and supplies and all the materials for improving these roads—sand, gravel, cement and so on—are transported by the railroads.

"Among the principal patrons of the Illinois Central System are concerns engaged in handling road-building materials and machinery and in the production and distribution of motor vehicles, accessories, gasoline and so on. It may surprise some of you to know that, according to our best estimate, the freight revenue received by our railroad from handling the various products connected with motor vehicles and good roads is more than one-eighth of our total freight revenue. Of course the proportion will vary with respect to different railroads, but I have no doubt that this traffic provides the railroads generally with a substantial part of their total freight revenue.

"I invite your attention to the great need for the development of highways

that will extend rather than duplicate the transportation routes already provided by the railroads. The highways that have been built in this country to date have for the most part been built along existing channels of commerce rather than with a view to opening up new channels. The result is that virtually every important line of railroad in the country is paralleled by hard-surfaced highways. It is too late to raise an objection to that phase of highway development. But since that need has now been fairly well supplied, we ought to turn our attention to the development of lateral lines to feed these highways and to feed the railroads operated along the same routes."

The sessions which followed were all of interest but probably the paper pertinent to our readers was that delivered by General R. C. Marshall, Jr., general manager of Associated General Contractors of America. This paper is reprinted in full in this number. One section of the session concerned itself with problems relating to the financing and locating of highways while the other section dealt with the contractors' problems in building the highways. We shall have more to say about the discussions in the February 1st number of Pit and Quarry.

Mr. H. G. Shirley was elected president of the American Road Builders' Association for this year. The new president is a man of broad experience. Mr. Shirley was born at Summit Point, W. Va., and graduated at Virginia Military Institute, receiving the degree of civil engineer. He became affiliated with the engineering department of the New York Central Railroad and later with the engineering division of the District of Columbia. He left this position to become assistant engineer of the Baltimore and Ohio Railroad. His next employment was as roads engineer of Baltimore County. He progressed from this to the position of chief engineer of the Maryland State Roads Commission. Maryland University has made him a Doctor of Science. He was connected with the Highway Transport Committee Council of the National Defence and Secretary of the Federal Highway Council, also serving as Chairman of the State Highway Commission.



## Effects of Certain Contract Provisions

By R. C. Marshall, Jr.\*

OPINIONS of contractors concerning many of the contracts that they sign are so generally known that it needs no repetition; yet in all the discussions of this subject to which I have listened, the primary cause of their complaint seems to have been misconstrued. This is probably due in considerable degree to a careless use of the term unfair, whereas the provisions commonly criticized are scored on the grounds of ambiguity or the injection of unnecessary hazard and indeterminate elements of cost.

While there are instances in which a public department or private owner, usually assisted by legal counsel, has not hesitated to deal to contractors from the bottom of the pack, these cases should not reflect upon the great majority of engineers whose instinct is to deal fairly. It is but natural that frequent use of the word unfair has annoyed the engineering profession considerably in discussion of its contracts, and has succeeded in beclouding the effect of certain contract provisions on cost and business management. Probably the best thing that can happen for all elements concerned in this important matter of contracts, is to forget the term unfair and to investigate more carefully a few economic principles which the construction industry generally seems to have overlooked.

Before touching specifically upon the effects of certain contract provisions in common use, I should like to mention briefly what appears to be one reason for their apparently haphazard development and the reason also for much unnecessary friction and conflict within the industry.

Although construction is probably the oldest as well as the largest industry next to agriculture and carries almost as great a responsibility for the nation's well being, economists as well as those directly interested have developed little data on its special economic problems. Only since the War, has it been recognized as an industry whose business cycle wields a mighty influence toward the stabilization of other industries when those industries are floundering in a general business depression.

In spite of its annual output of between five and eight billion dollars, about the only time that this industry has moved into focal range of the press or the public has been when it served as a political foot ball or hatched out one of its scandals. Even at these times, it has received but little analytical study except from the angle of political expediency. Its problems and practices have generally been dismissed from the public mind, and in fact often from the engineering mind, with the assumption that the business of construction is a black sheep and never can change its color. Such impressions are due almost entirely to ignorance of the business end of this industry and one of those factors which have contributed to its delinquency.

I have never seen a book on construction economics or administration that would give the young engineer an insight into the business intricacies of the industry with which he must deal or which would point out to him those basic principles of economics which are so essential to his successful administration of construction contracts. Our technical libraries are loaded with volumes on design, which are, of course, indispensable to that minority which becomes technicians; but for the majority of young engineers who eventually move into executive or administrative positions, the library shelves are bare. Since many of them go either directly or eventually into a construction organization, this matter is of concern to contractors as well as to the professions.

Though the lack of necessary training may be due directly to the failure of engineering faculties to perceive the need of the engineering professions and the construction business, one cannot help feel that the major fault has been with these two elements themselves. In so far as I know they have never crystalized their opinions and given to the universities the benefits of an authoritative expression of their needs. It appears also that the engineering profession itself has not kept abreast with the economics of the construction industry or that it generally realizes how inseparably it is linked with the other elements in the responsibility for proper development of methods and

\*Address of R. C. Marshall, Jr., before American Road Builders' Association, January 14, 1926.

trade practices and for the cost of construction. By this I do not mean to imply that contractors, manufacturers, dealers and the bonding companies have kept abreast, for we all seem guilty of the charge of gross neglect. What I do mean to impress though is that no one element of the many who are concerned in construction can clean the Augean Stable of this industry without assistance.

From the general contractor's point of view, the industry has what might be called three pernicious triplets, all of which are in need of expert attention. They are the lien law, the bond situation and day labor. None of their afflictions were brought on by responsible contractors and they cannot be cured by his hand alone.

A well-known engineer, said not long ago, that as soon as the responsible contractors of the country got rid of the irresponsible contractors in the industry, he would like to adopt arbitration. But with the lien law and the surety bond establishing automatic credit for any man who desires to call himself a general contractor, it is likely that we will not obtain arbitration under that engineer for a long time.

Another engineer out in the northwest told the president of our association that if the surety companies did not stop bonding irresponsible concerns his department would be forced to resort to day labor. Obviously these things are a matter of concern to all elements of the industry.

A short time ago the material dealers national association adopted a resolution that all cement should be distributed 100 per cent through dealers, thus implying that wholesale prices to the public bodies and other large purchasers should be discontinued. In other words, the dealer should obtain a commission on any cement used in his locality whether it passes through his hands or not. These are a few of the many conditions in which everyone who lives by the construction industry should give some thought. There are many others, also into which we all can well afford to take an interest.

To revert back to the question of contracts, it seems to me that as long as the work under a specific contract is clearly defined and the parties to the contract are of one mind as to what shall be done and how it shall be paid for, the question of fairness

ceases to exist. The trouble is that this condition does not obtain on far too many construction contracts.

State highway specifications usually set up an estimate of quantities by which the contractor determines his overhead costs and to which at so much per unit these costs must be distributed. If some of the units are omitted, the overhead assigned to them is left uncovered and stands as an uncompensated expense of the work. Yet most specifications provide that the department, without making any adjustment whatever, has the right to increase or diminish these quantities or leave out any portion of them altogether. Obviously a material reduction of quantities or even an extension of the work if prices are rising, change the actual unit cost of the work. Thus the contractor builds something different from what he was lead to believe he would build and in effect the original basis of the contract is altered. This the courts have so held repeatedly where increase or decrease of quantities are excessive, and it may be added more than 10 per cent may often be interpreted as excessive.

There is no question but what these changes must be made on occasion, and some proper provision therefor should be included in the contract, otherwise the bidder can protect himself only by charging his overhead to those units most likely to remain constant, thus unbalancing his bid, or by adding an item of contingent expense in his estimate. Since changes must be made, since court interpretation of these unlimited right of change clauses is quite clear and since they add an item of cost to the work it might be well to eliminate them in favor of a more scientific provision. In a few contracts this question has been handled by giving the department a right to change the quantity of the work up to say 5 per cent without change of price, and by having the bidder state unit prices in his proposal for other percentages of change. This plan I am advised has been tried successfully by a number of engineers.

The effect of so-called drastic contract provision upon the actual cost of a construction project does not seem to be very generally appreciated. By a drastic clause is not meant one which provides swift and sure penalty for violation of contract, but one which makes impossible an accurate

estimate of cost, which tends to conceal elements of cost from a bidder, or which makes acceptance of the other contracting party's opinion a condition precedent to payment. These clauses appear to have grown out of a perfectly natural desire of the owner and his representatives to be protected against every possibility of loss until their project is delivered complete and unencumbered.

No one can justly blame them for wanting this protection, but it should be apparent that this assurance in connection with a construction project, dependent as it is upon so many uncertain factors, actually involves a significant item of cost. When a contractor guarantees a structure against acts of God, and all other contingencies of construction, he has underwritten about the poorest risk to be found in industry. No insurance company will under-write it and he must carry it himself.

Some of these hazards can be more cheaply assumed by the owner than the contractor and the insurance premium eliminated from the cost of construction. I presume that one reason why this is not generally done is that we have always with us a supply of individuals who will gamble at anything and frequently the owner can find a bidder who attempts to conduct an insurance business without collecting a premium.

In general these so-called drastic provisions effect the cost of construction in three ways.

First, by introducing hazards or uncertainty of requirements which the construction company can not estimate and must therefore be covered by a contingency charge.

Second, by restricting competition, and third, by actually increasing the cost of operations through specifying unattainable perfection or increasing the financing charges of the work by heavy retainages or delayed payment. A few examples will serve to show that the effects mentioned are real and not illusionary. As a clear example of introducing unnecessary hazard a quotation from the general conditions of the standard contract of the American Railway Engineering Association will serve. This clause states that:

"Should any work or material be required, which is not denoted in the specifications or plans, either directly or indirectly, but which is nevertheless necessary for the proper carrying

out of the intent thereof, the contractor is to understand the same to be implied and required and shall perform all such work and furnish any such material as fully as if they were particularly delineated or described."

Another good example found in various state highway contracts reads as follows:

"The engineer may, by written notice to that effect, suspend all or any portion of the work if, in his judgment, the same cannot be properly done for any reason beyond the control of the contractor, but no allowance of any kind will be made for such suspension except an extension of time for the completion of work."

These clauses and others of similar nature are accompanied by a clause giving the engineer (in effect one party to the contract) final decision in all matters of disagreement. The possibility of extra cost which cannot be foreseen or estimated by the construction company under such provisions is obvious. Of course where it is possible to sue the state, and the amount of money involved is sufficient to warrant legal action, the contractor can recover in spite of this clause if he has sufficient cause. But some states cannot be sued. Often the amount involved would merely pay the attorney's fees and consequently the construction company charges it up to profit and loss. Any contractor who does not put in his bid some sort of a contingency allowance for these provisions, is ignoring the most elementary principle of sound business.

It is difficult for a bidder who knows his operating costs, and knows also the cost of insuring owners against acts of God and other contingencies, to believe that the clauses here mentioned are not a premeditated effort to get something for nothing. In a measure perhaps they are—not that a department expects to get units of work without cost, but that it seeks a protection which should be underwritten by Lloyds of London, yet fails to perceive that premiums therefor must be charged as an element of cost.

A tendency of this condition has been to make of construction too much a battle of wits and not enough the rendering of service under reasonable hazard at a reasonable profit. Forty per cent of the corporations engaged in construction in 1923 made no net income, according to the in-

come tax department, and for those who made a profit the average was about 2.1 per cent. This condition, which is due greatly to excessive hazards, benefits neither the industry nor the public.

On occasion the insurance premium to cover contingencies may be forgotten or crowded out of an estimate by ignorant bidding, but there has yet been devised no way whereby a department can recover the loss occasioned by inadequate competition. Competition may be lost either by making contracts too drastic or by using clauses which make it impossible for many bidders to undertake the contract.

I have no specific contract to quote in this instance though I have seen many of them which automatically reduced the number of bidders. This can be done by requiring commencement of the work within specified time. I know of a certain project on the Mississippi River where such a provision stipulating thirty days eliminated all of the contractors on the west coast, some of whom were anxious to bid on the project.

When a contract contains a date of completion with penalty, the date of commencement is of little practical value. In the first place, commencement may be superficial yet legal and in the second place, it is practically impossible to determine when the work is actually commenced. Assuming that commencement can be clearly defined and determined, there is still the possibility that the limit set will exclude any bidder however suitable, who cannot release equipment on some other project for thirty-five, sixty or ninety days. A more rational procedure would be to eliminate the date of commencement and hold to the necessary rate of progress for a specified date of completion.

Probably the most outstanding effect on cost to be noted, is that of increasing the direct construction expense. An example from the Federal Government will show how this occurs. One of the departments had a project, estimated to cost about two million dollars and after extensive advertising, they received but two proposals. As this department had signified its intention of departing from day labor, the Associated General Contractors exerted its efforts to interest contractors all over the western states in this project. Many of them said that they would bid unless

the contract form was found to contain a joker.

Unfortunately the contract did contain a joker, which prevented many firms from submitting a proposal. The trouble was in the payment clauses. An analysis which one of the companies gave to me indicated that by reason of terms of payment, it would be necessary for a contractor to have something like eight hundred thousand dollars of his own money tied up in this two million dollar project before it was completed. These provisions automatically eliminated a great number of bidders who could have handled the project satisfactorily under usual terms of payment. Not only that, but the clauses used injected into the work an unnecessarily heavy item of interest.

Some of the State Highway Specifications hold back 15 and 20 per cent as a retainer, which merely adds an unnecessary item of interest and reduces the number of marginal bidders capable of handling the project. I do not say that this always reduces the number who think they are capable of handling the project, because hope springs eternal in the contractor, and the more inexperienced he is, the further it springs.

Heavy retainages seem to be of little practical value, since they are not large at a time when a dishonest concern is most apt to default, and often brings on default by increasing the financing problem of the contractor at a time when his other difficulties are at a maximum. The policy of reducing the retainage when the job is half done, or of making progressive reduction when it progresses satisfactorily, has I believe been thoroughly justified by the experience of those departments that have tried it.

In any discussion of contracts it is difficult to keep from drifting more or less deeply into the matter of arbitration, as it affects vitally the attitude of the contracting parties toward each other as well as the character of construction service. I will not go deeply into the pros and cons, but I hope that all parties concerned in the construction industry will give this subject more analytical study in the future, as it offers great possibilities in removing much of the friction encountered by the various elements of industry in their transactions with each other.

In our office are on file a great many sub-contract forms used by

members of the Associated General Contractors, practically all of which contain an arbitration clause. This clause was not put in at the instance of sub-contractors who demanded a means of impartial determination, but was put in by the general contractors themselves who realized the benefits to both parties. It is possible that the engineering profession like architectural professions and contractors will, upon further study, arrive at the same conclusion.

Construction is, I believe, the only industry in the United States wherein the purchaser is generally opposed to arbitration. This may or may not be significant, but I believe it is one indication of why the construction industry is struggling with business practices and economic problems that have long ago been solved by other industries. Those industries have ceased to debate as to whether an arbitration clause between buyer and seller is advisable and have turned their attention to the necessary means of enforcing arbitration awards where such means are not already provided by law.

At the last session of Congress, a federal law was enacted to make enforceable written agreements to arbitrate disputes arising out of contracts, maritime transactions or commerce among the states or with foreign nations. Similar laws suitable to state needs have been passed by New York, New Jersey, Oregon and Massachusetts, with other states likely to follow.

In the discussions on arbitration that have come to my attention, it seems to have been assumed that the agreement to arbitrate is something which acts purely in favor of the general contractor and is something that the other party to the contract more or less gives him as a present. No conception could be farther from the actual truth. Arbitration when properly written into a contract gives the contractor nothing that it does not give the owner and it strengthens immeasurably the hand of the engineer.

I believe there is no greater evidence to the need of arbitration than that given by the enormous record of law suits in construction. In a vast majority of these, the decision has favored the contractor. Often the contractor has won on a technicality that would never have been countenanced by an arbitration board drawn from within the industry. The man

who is acting in bad faith will invariably seek the court with competent counsel in preference to seeking arbitration.

These points, however, do not represent in the judgment of those who have tried it most thoroughly, the principal value of an arbitration clause. The American Institute of Architects which has long used such a clause in its standard contract would not think of doing otherwise. Its representatives on the Joint Conference on Standard Construction Contracts indicated that the Institute would not participate in the Conference if it proposed to draw up a contract form without provision for arbitration. This they considered a backward step which would have destroyed the work done within their society throughout nearly a generation.

The form of arbitration contained in the Conference Document and that which is most widely favored gives the engineer full authority as to the result to be produced and the same control of the work that he has always had and merely provides that disputes involving extension of time or compensation in accordance with the terms of the contract shall be settled by agreement or arbitration. The greatest value of such a provision is not in its actual exercise to determine monetary awards, but in its effect upon the attitude of the contracting parties. Its chief influence is to prevent the assumption of hasty or arbitrary stands from which neither party will willingly retract, and to bring about agreements which are mutually satisfactory without resort to legal action. The representatives of the American Institute stated before the Joint Conference that in their opinion, it not only eliminated in most cases the need of litigation but also the need for arbitration itself.

On the contracting side of the fence, we look forward hopefully to the establishment, not only of arbitration, but also more standardized contracts in general, which will gradually build up a sound and enforceable code of contracting practice. We believe they will facilitate interstate competition, decrease disputes and litigation and tend to make it more difficult for any dishonest concern to continue operations.

Before concluding, I should like to emphasize one other point which con-

cerns yet transcends the subject of contracts.

As one considers the record of defaulted contracts, particularly in highway work, it seems very likely that both engineers and contractors have not perceived the limitations of a legal contract. By this I mean there seems to be a feeling that if a contract is sufficiently air tight for one party or the other, that party has protected itself in every possible way. Yet if we consider the matter carefully, we realize that no form of contract can produce a high grade of work and honest performance from a low grade contractor who is dishonest.

Instances are innumerable where projects have been awarded to contractors with full knowledge that they could not perform the work satisfactorily and would eventually default. The evils of such procedure and the trouble it has caused from one end of the country to the other are too generally known to bear repetition. It is a procedure which no sane man would follow in buying a suit of clothes.

This is not offered as a criticism of engineers, because we all know what the engineer in charge of public construction is up against in awarding contract. Until he receives sufficient support from the responsible element of every group concerned in construction and until these groups make it their business to see that the engineer with the courage of his conviction is not made the victim of political expediency, they must suffer the consequences. I am only mentioning the subject because there is now a ray of hope discernible for its correction.

In the last few years, we have witnessed an innovation in construction industry in the form of joint conferences and discussions between the various groups. At times we almost tire of the words "cooperation" and "conference," but these gatherings are gradually leading us toward a real understanding of construction and the means for its proper development. Practically every one of the conferences is developing information that has never been placed in written form and made available to those concerned. The members of these conferences are actually engaged in original study of construction economics.

Fortunately the thought is spreading through the industry that dishonest or incompetent concerns should

not be allowed to disrupt or plunder public construction and corrective measures within the industry are taking form. A practical means of exercising intelligent selection of bidders and of knowing their qualifications has been devised by the Joint Conference on Standard Construction Practices. This conference, composed of committees from nine national associations, has issued a standard form of questionnaire and financial statement for investigating the qualification of bidders. It has been officially approved by the American Association of State Highway Officials, and those who have developed the plan feel that its use will go far in elevating standards of performance within the industry. The application of these questionnaires and their results are being watched with interest by all who are concerned over the annual volume of defaulted contracts. They may not be as effective as we hope, but they will help greatly and above all they represent a concerted action on the part of all construction elements to exercise constructive cooperation.

### The Temple Bill

While the program of economy being attempted by our Federal Government is a laudable endeavor there is a tendency to carry such a program too far. There are certain fundamental items in our government program which do not lend themselves to any further reduction in expenditure. Responsibility belongs with the people as well as the Government departmental heads.

The Director of the Budget Bureau, in presenting the Government's budget to Congress has reduced the appropriations for making basic topographic maps by nearly 50 per cent. This action conflicts with the program adopted by Congress last year to complete the topographic mapping of the United States within twenty years. This provision by Congress was included in what is known as the Temple Bill—H.R. 4522—"An act to provide for the completion of the topographical survey of the United States." This act authorized an appropriation of \$950,000 beginning July 1, 1926, for the initial year in the proposed twenty year program. The Budget Director has ignored the provisions of this bill and has asked for an appropriation of \$477,000.

## Three Neglected Essentials

By A. O. Deringer

**B**ECAUSE the three primary operations in every open pit stone quarry, stripping, drilling and blasting are considered so much a matter of routine and as unavoidable as death and taxes they are frequently given scant consideration. This attitude of course does not make for economical production costs. Because these operations are the prime essentials in every quarry they should have the personal attention of the operator and first consideration in computing costs. Every operator at the outset of his work has had to face his stripping problem, he has devised a simple and economical method, but if in his advancement and expansion, he still resorts to his old method which has now become crude and cumbersome, he is paying for his lack of foresight. There is no fixed rule for a stripping proposition other than to move the overburden in the quickest simplest and cheapest manner consistent with existing conditions.

The drilling and blasting phase of an operation are deserving of the most attention, and it is of these that I wish to draw the readers attention. In a large plant producing several thousand ton per day, the steam shovels and train crews are under scrupulous supervision to see that no lost motion creeps into the working out of some plan that has been devised to increase output, and that everything works with clock work precision, until it comes to the actual working of the steam shovel which heaves and hauls at a bank of almost solid stone which owing to the lack of attention has not been properly drilled and blasted. Here the operator pays for his negligence in delays and repairs occasioned by undue strains and in excessive secondary shooting and the possible waste of explosives in the initial shooting.

Every quarry operator should realize the fact that a man who can handle drilling machinery in an expert manner is not of necessity the best man to employ to do his drilling, as he may be entirely ignorant of the fundamental requirements of the job outside of the actual drilling of bore holes.

Neither is the man who understands all of the workings of explosives, always the best man to do the

blasting. It matters not what methods are pursued in the various quarries throughout the country, nor the formation unless nature has been exceedingly kind, nor the use to which the finished product is put, the drilling and blasting should always have the best attention in order that the first costs in any operation be not out of harmony with the others. It is all well and good that due care and caution be given to increasing the output, but in so doing every phase of the entire operation must be kept in sight.

Some men give no further attention to their drilling problem than the number of feet drilled in a given time, or the cost per ton for drilling. I have in mind an operation which employs well drilling machinery and pays on a foot basis. It has been found that some drill holes in this operation were as much as twelve feet below the quarry floor. This plainly shows that supervision was entirely lacking both as to depth of drilling and undoubtedly as to the spotting of holes for best results.

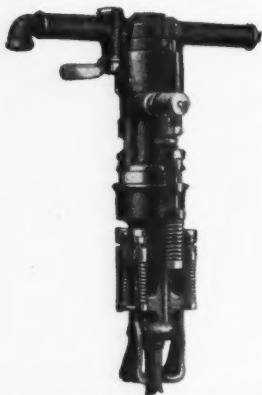
Some operators give their blasting no further concern than the displacement per pound of explosives and even going so far as complimenting the blaster on his good work when in reality he has been an expense to his employer in so far as producing the very best results by his blasting go.

How can a blaster do good work under these conditions, he is bound to waste explosives, unless he fills the holes to the floor level. Such practice makes for losses in time money and material and I dare say that a good many operators do not take the time to see that the driller spots his holes properly, or that he drills them of proper depth. They do not supervise the blasting to see that the charges are so placed and of proper grade and proportion to give the best results. There should be no fast rule for a quarry man to work by when it comes to doing his drilling and shooting, unless he has passed the experimental stage and knows of a certainty that his drilling is spotted are spaced to do his work to the best advantage, and that he has come to the best means of doing his blasting and is thoroughly satisfied that his method cannot be improved.

## Cleveland Drill Stands Test

Contrary to the ideas usually held by the layman, if all rock drilling were in very hard stone, such as granite or trap rock, the life of the rock drill maker would be little short of a delightful dream. It is in variable ground that the real drill shows its mettle. When the rock is alternately hard and soft, full of fissures and clay seams, or when it is cracked up, ravelly, shattered, or a combination of all these, then drilling all too often becomes a real problem.

As an example of bad ground, and of what a highly versatile rock hammer will do to it, the recent tests of the Cleveland Model 44SDRA at the enormous pit of the Cleveland Brick and Clay Company, stand out an interesting item in the news of progress in this highly specialized line of manufacturing endeavor.



Cleveland 44 S D R A Drill

The ground at this pit is a tough mixture of sticky clay and shattered shale. There are numerous sand-stone strata, varying in thickness from a few inches up to two or three feet, and occasional granite boulders—"nigger heads"—are encountered, and must be drilled along with the rest.

Until recently, this ground has been drilled by hand, the holes being cleaned with water and a slender baling bucket. The work was slow and laborious, and one fifteen-foot hole was all any man could do in an eight-hour day. When Cleveland was given the opportunity to demonstrate, two rock drill manufacturers had already tried the job and had gone away, leaving

their broken and twisted drill steels stuck in the holes.

The Cleveland Company had a choice of several hand sinkers for this class of work, and it was decided to attempt this difficult drilling problem first without using water, auger steel, or any means for hole cleaning other than the powerful blast provided by the 44SDRA machine. It was quickly found that this hammer was equal to the occasion, as it drilled the fifteen-foot holes at the rate of twelve inches per minute, including the time to change steels, cleaning the holes perfectly, which permitted the steels to be withdrawn without difficulty.

N. K. Wilson, secretary of the Wisconsin Mineral Aggregate Association, says:

"The only highway work that was done during the year 1925 was federal aid and a few isolated portions of state and county aid, making a total of about 125 miles, which was about 150 miles less than that of the previous year. 1925 was about the poorest highway construction year that we have witnessed in Wisconsin since the state system was started.

"The city concrete street construction showed a small increase over that of 1924. This total of about 1,575,000 square yards should be eclipsed in 1926.

"The lack of highway work in Wisconsin, coupled with the small amount of work done in Illinois during the past year brought about a huge overproduction in the sand, gravel and crushed stone industry and we found that many companies were seeking new markets, thereby extending their radius of shipment.

"The outlook for 1926 is extremely promising, especially now that we have a definite highway law. There will be approximately 150 miles of federal aid construction this coming year. With the additional work to be done by the various counties, this should be increased by another 100 or 150 miles, making a total of 250 to 300 miles of work, which is more than a 100 per cent increase over 1925. The city work should show at least a 50 per cent increase, or in round numbers, the city work should equal approximately 2,500,000 square yards.

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## Novo UF Two Cylinder Engine

The UF Engine is Novo's latest contribution to the industrial world. It is the result of eighteen years of building good engines and contractors' equipment. This power unit develops 3 to 6 h.p. It is a two cylinder, four cycle "L" head, hopper or radiator cooled gasoline engine. The crankshaft and power drive shaft run in roller bearings, and the connecting rod bearings are pressure cast babbit, reamed and burnished. The cam shaft runs in brass bushings.

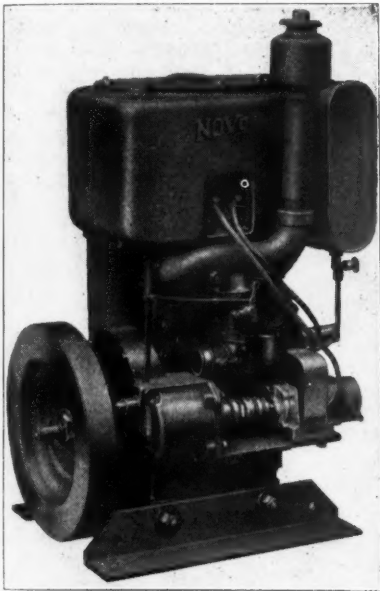
The engine has an independent drive shaft which can be placed on

end. The 600 and 1,200 r.p.m. gear combinations may be had in either direction of rotation. The 1,800 r.p.m. gear combination rotates the drive shaft clockwise or right hand direction of rotation, looking at the engine from the flywheel end.

Crankshaft is opposed throw type, eliminating crankcase pressure, and making a well balanced engine not hitherto found in two cylinder engines. It runs at 1,200 r.p.m. Engine is cranked right hand—clockwise direction of rotation—in all cases. Drive shaft is gear driven from crank shaft.

Standard equipment consists of: Splitdorf high tension magneto and Zenith carburetor, fuel tank and cooling system. It is furnished in hopper and radiator cooled types, and with or without steel house.

The engine has a 3 inch bore and 4 inch stroke; displacement of 56.52 cubic inches; the connecting rod bearings are  $1\frac{1}{2}$  inches in diameter by  $\frac{1}{2}$  inch. The piston pin is  $\frac{3}{4}$  inch diameter, hardened and ground.



The UF Model Novo Engine

either right or left side of the engine. The drive shaft can be furnished to rotate in either direction of rotation and at several different speeds. In all cases, the governor, carburetor, manifold and magneto side of engine is away from drive shaft side of engine. In other words, the working parts of the engine are always accessible; the mixer, or whatever machine the engine is operating being on the opposite side.

The engine can be furnished to run the power drive shaft at 400, 600, 1,200 and 1,800 r.p.m. The 400 r.p.m. gear combination rotates the drive shaft left hand, anti-clockwise, looking at the engine from the fly-wheel

## New Hayward Bucket

Engineers of the Hayward Company have designed a new clam shell bucket for demolishing snow piles. The bucket is easily convertible into the standard type of ore bowl clam shell. The same operating mechanism and connecting rods are used in both cases. The  $1\frac{1}{4}$  yards snow bucket is convertible into the  $\frac{3}{4}$  yard standard bucket and the  $1\frac{1}{2}$  yard snow lifter can be altered to the 1 yard clam shell.

The snow buckets have demonstrated their broad field of usefulness and their unusual speed and power. They can be used for loading trucks, cutting gutter channels for the flow of melted snow, keeping ditches open and clearing mouths of drains and keeping railroad tracks clear.

The manufacturers claim the handling ability of these buckets is limited only by the speed of the hoisting unit and their closing power soon crumbles the hardest packed frozen snow pile. The manufacturers say they will not slide over the icy slopes of a frozen snow pile but have ample power to dig their way in.

The Hayward orange peel bucket has also been successfully used for snow removal by western railroads.

## Miami Scraper Improvements

Refinement and improvements in the Miami one-man power scraper have been announced by the Miami Trailer and Scraper Company, the manufacturers. In place of the straight axle originally used, a cranked axle has been installed which gives ten inches of additional clearance between the scoop pan and the axle, making the dumping of dirt easier. The double link which formerly fit on the side of the pan has also been removed. The scoop lifter hook has been eliminated and the lifter barsheave bracket side member has been shortened about an inch. The sheave wheel is fastened to the scoop lifter bar by a U-shaped bolt. These changes allow the scoop to be pulled a little more than seven inches past the vertical center when pulled to the full dumping position. Stop castings are mounted upon the track rails so that the scoop pan may be brought to its full dumping position or beyond a vertical dumping position before the track rollers are fully engaged in the track rail stop castings. This full dumping position is reached without engaging the two sheave wheels mounted on the up-right frame and the sheave wheel, mounted on the scoop pan so that it is impossible to batter or fray the lifting cable in full dumping position.

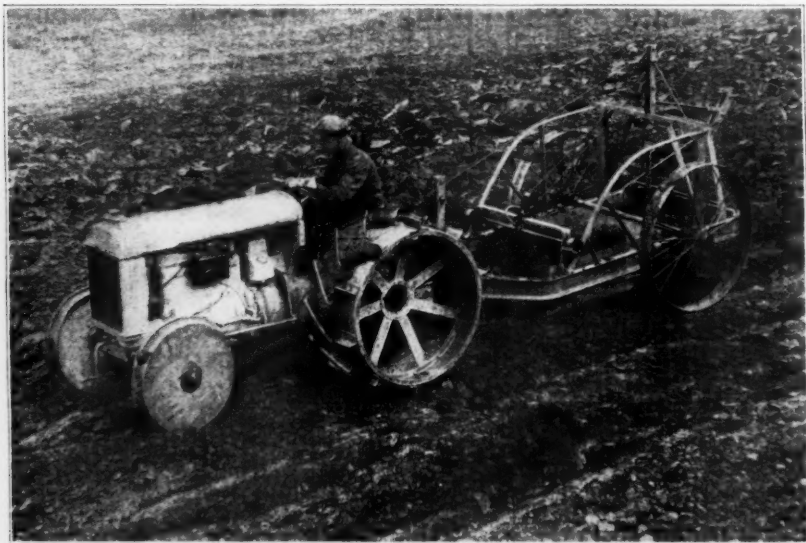
This construction also provides slack in the lifting cable with the

scoop in its full dumping position so that no part of the scraper or the Miami power winch is subjected to any stress or strain from a tightened or taut cable. The scoop pan is constructed of  $\frac{3}{8}$ -inch high carbon steel or of the same material as ordinarily used in the construction of cutting blades.

The scraper is furnished with the Miami hook and eye tractor hitch and the Miami power winch. The Miami hook and eye tractor hitch and drawbar connector are so constructed of steel castings, the tractor hook hitch being of higher carbon contents than the drawbar loop connector, resulting in any wear through hard service coming directly upon the loop connector mounted on the drawbar.

The loop connector is held into the tractor hook hitch by a keeper and can be operated under the most adverse conditions, without any likelihood of becoming disconnected. The trailer scraper may be connected or disconnected within a few seconds time permitting the use of the tractor for any other purpose.

The improved Miami power winch assembly from which power is derived from the Fordson tractor to operate the scraper is of sturdy, rigid construction, full provision being made for proper lubrication and for the various stresses and strains. The



Miami Scraper With Tractor

thrust load from the friction drive wheel is taken by a ball thrust bearing. The radial load of the main drive shaft is carried by two large Timken radial bearings. The rear thrust load from the worm or drive shaft is taken by a large Timken roller bearing with high thrust qualifications.

The two Timken bearings in the rear of this power unit are lubricated from the heavy oil of the gear case, the forward Timken bearing and thrust bearing being lubricated by grease cups mounted on the winch.

The drum shaft is driven by a heavy bronze worm gear built to S. A. E. specifications. The worm is hardened and ground. The bronze gear is mounted rigidly to the drum shaft its lower bearing consisting of a 2 3/4-inch heavy bronze bushing. The top bearing of the drumshaft is connected to the yoke casting. This construction provides no movement from centers of the bronze gear and hardened and ground worm.

The gear and worm as well as the two Timken bearings are lubricated by the insertion of three pints of heavy oil through a filler cap on the gear case cover. A drain tap is also provided on the under side of the gear case so that the old oil may be drained and replenished from time to time as required.

The gear ratio between the friction drive and the cable drum is on the basis of 30 to 1 providing a very powerful winch, rigidly constructed of the very best of materials and capable of standing up under the hardest service for an indefinite period.

The Miami power winch remains permanently on the Fordson tractor after mounting, but can be removed by taking out the four stud bolts by which it is held to the differential housing and the one U-clip bolt.

The Harnischfeger Sales Corporation, builders of P. & H. Cranes and Excavators, announces the removal of their Birmingham office from 431 First National Bank Building to 401 Pioneer Building. Mr. J. Van Buskirk is district manager in charge.

The K. B. Pulverizer Corporation announces the removal of its New York office on December 23rd to room 1946 Grand Central Terminal Building, 70 East 45th Street.

## New Racine Radiators

The Racine Radiator Company is offering a special type of road building radiator, which will be of interest to all operators in the heavy duty field. This radiator is constructed of core and tank assembly fitted into a heavy one-piece pressed shell which fastens to the truck frame and takes all the wear and strain. The manufacturer claims this construction prevents any strain being transmitted to the radiator core assembly proper. The radiator is made of various types for all makes of engines and constructed to meet the specific requirements of any width of frame or size of truck.



The New Racine Radiator

Another type of radiator put out by this company has been extensively used in power units or engines of 75 to 100 H.P. This radiator has top and bottom tanks and side members of cast iron and the cores held in place by both the top and bottom. These can be readily interchanged or replaced in case of accident. The core is made of individual tubes, each of which are made of one-piece material. The core member is of bronze and is also especially recommended by the manufacturers for heavy duty service.

I. R. C. Sand and Gravel Co., Iron-  
ton, Ohio. Capital, \$50,000. Incorporators: Joe L. Wilson, G. C. Harden, Wm. Prindle, Joe L. Wilson, Jr., and Laura Harden.

## Bucyrus Shovel Combines Many Features

Railroad type shovels, long the most adequate digging tool in ore and rock, have always had certain inherent shortcomings, which resulted in the frequent installation of small revolving shovels on work which was unquestionably beyond their capacity. The railroad type shovel lacked mobility. It worked very close to the bank and its digging and dumping radius was limited. On the other hand, the revolving shovel lacked the strength, power and capacity of the railroad type.

The Bucyrus 120-B is built to combine the advantages of both the railroad type and the full revolving shovel. This new shovel, the manufacturers claim, combines the speed of action of the railroad type shovel; the mobility of single truck caterpillars; full revolving swing; four-yard dipper capacity; ruggedness and power greater even than the railroad type shovel.

The machine has a dumping height of 20 feet. Its dumping radius is 36 feet. The boom is 29 feet long and the rear end radius is 17 feet. The machine is designed and built with one idea constantly in mind, that of building a machine which would be as free from interruptions in operation as it was possible to build. To this end all parts are made with a rugged-

ness much greater than in shovels formerly built.

The machine is planned from beginning with the thought of efficient operation and the steam machine includes features which are entirely new in steam shovel design, such as fire brick arch and superheater as standard equipment. The electric machine is equipped with Ward-Leonard direct current, generator field control. It has been possible in the design of this machine to eliminate the necessity for compressed air on the machine.

### New Hardinge Catalog

The Hardinge Company has just issued a new catalog, No. 13-A, which gives a complete description of the company's conical grinding mill. The booklet, which is profusely illustrated, has a comprehensive general discussion of the subjects crushing, grinding and pulverizing and a concise section on the theory of grinding. This is followed by a discussion of the operation of the Hardinge mill and a section devoted to recent developments and design. Applications to mining and the cement field are thoroughly discussed. The last half of the catalog is devoted to a description of the construction and specifications of the various types of Hardinge mills.



Bucyrus 120-B Electric Shovel at Work

## The New Erie Gasoline Shovel

A gasoline shovel that operates without a single reversing friction clutch in either the crowding, swinging or hoisting train has just been placed on the market by the Erie Steam Shovel Company, following three years of extensive testing and actual operation on the job. Instead of taking off the power for crowding and swinging from a single gasoline engine, through reversing friction clutches, the Gas+Air Erie's "crowd" and "swing" are driven by direct-connected engines running on heated compressed air.

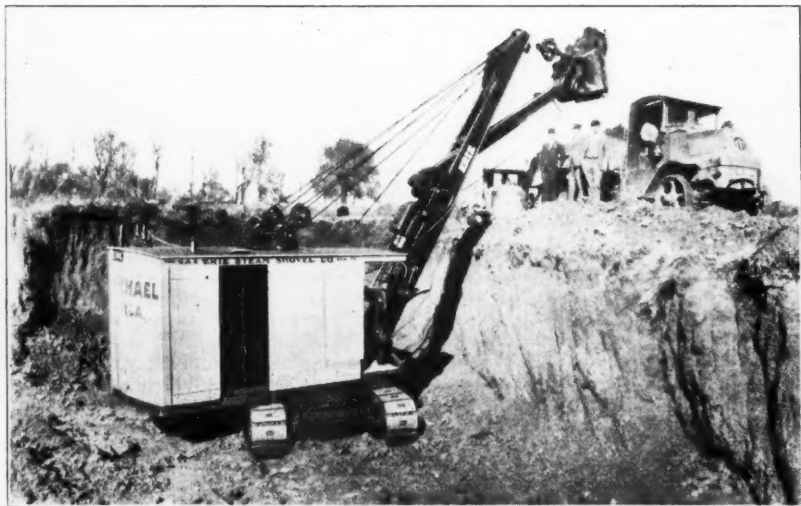
The gasoline engine—a 4-cylinder Waukesha with Ricardo head, 5¼ inch bore by 8 inch stroke—drives the "hoist" directly. It is at all times ready to exert its full and undivided power for hoisting when needed—while stored compressed air is always available for the swinging and crowding engines. Whenever the full power of the gas engine is not being used for hoisting or traveling, its surplus power is stored as compressed air, until the storage tanks are up to maximum pressure. Connected direct to the gasoline engine is a big heavy-duty air compressor that utilizes the surplus power—which would otherwise be wasted—to drive the crowding and swinging.

Air is piped directly from the compressor to the crowding and swinging engines when the full power of the

gas engine is being taken by the hoist, when the compressor automatically unloads—stops pumping. On its way to the crowding and swinging engines, the air is heated to above 400 degrees Fahrenheit, in a heater which utilizes the exhaust heat of the gas engine. This valuable heat energy, ordinarily wasted by a gasoline shovel, is put to work in this machine to increase the efficiency of the compressor. This heating of the compressed air increases its volume approximately 75 per cent.

Because the air is so heated, a smaller part of the gas engine's power is used to compress air for the swinging and crowding engines. Nearly all power shovels use approximately 40 per cent of the total power for driving the "crowd" and "swing." This is reduced to 25 per cent on the Gas+Air Erie, due to the storage and heating of the compressed air. Seventy-five per cent of the power is used for hoisting—and the full 100 per cent always comes into play when needed for hoisting.

Storing power as compressed air, and utilizing the exhaust heat of the gas engine, have resulted in new records for fuel economy in gasoline shovel operation. Gas+Air Eries are averaging only 5 to 6 gallons of gasoline per 100 cubic yards dug, the manufacturers claim. The engine runs substantially at normal load and speed all the time.



New Gas and Air Erie Shovel

Some of the other advantages of gas-air operation, reported by owners of these machines, are as follows:

**Speedier operation.** It is claimed this gasoline shovel "swings" and "crowds" just as rapidly as a steam shovel, having the same type of direct-connected engines. These engines are always in gear; no time is lost waiting for crowding or swinging clutches to take hold. The dig-and-dump motion is a continuous spiral. It digs from 25 to 50 per cent more than a single engine shovel.

**Can dig harder material**—as the full power of the gasoline engine, direct-connected to the hoist, can be helped by the full power of the direct-connected air engines when needed. The constant torque limitations of the gasoline engine are remedied by the action of the air engines. The "crowd" and "swing" can add extra power to the "hoist." The three engines pulling together have given some remarkable results in the digging of extremely hard shales, which would previously have called for the use of a steam shovel.

**More accurate cutting.** It can level off a smooth floor for highway grading, or trim a vertical wall exactly to line. The direct-connected air engines give a delicacy of touch that permits accurate placing of the dipper. As easy to control as a steam machine and as smooth. Any good steam shovel operator finds no difficulty in understanding the machine, and can step right up on it and give good results. Simple control by three throttle levers—the hoisting clutch being set by an air ram, like the steam ram on a steam Erie.

The machine is simple and rugged, with very heavy duty construction. The gasoline engine has 3¾ inch diameter crankshaft bearings; the air compressor has 4 inch diameter crankshaft bearings. This same standard is carried right through.

The Gas+Air Erie presents a combination of gasoline and compressed air power which is unique, as shown by the basic patents that have recently been allowed. It gives the operating flexibility of a steam machine, combined with the advantages of gasoline fuel—quick starting without standby losses, convenience of liquid fuel in place of coal, water supply unimportant, no smoke, almost noiseless, little or no trouble with freezing in cold weather. Another convenient feature is the air starter for the gaso-

line engine, and compressed air available for rock drilling, pumping, riveting, or for use in any kind of air tool.

### Link Belt Changes

For some time it has seemed advisable to the management of the Link-Belt Company to create a new position—that of Chief Engineer of the company. This new position carries with it the responsibility of general supervision over all engineering work, harmonizing the practice of their several plants, and following up new engineering development.

The position is being filled by Mr. W. W. Sayers, formerly Chief Engineer of the Philadelphia plant. His new headquarters will be at the general office address, 910 S. Michigan Ave., Chicago.

It is said that Mr. Sayers is admirably fitted for his new and important duties. He graduated from the University of Illinois in 1897 and, in his 23 years of Link-Belt experience, has successfully held many important positions in the engineering, construction and sales departments of the company.

Mr. George L. Morehead, for the past 6 years attached to the Management of the several Indianapolis plants, and who has made an enviable record for himself there, as well as at the Link-Belt Chicago plant, takes on the duties of Manager of the Philadelphia plant.

Mr. Morehead graduated from the University of Missouri in 1902 and has been with Link-Belt Company for the past 19 years. In these active years he has successively held the positions of Maintenance Engineer, Superintendent of Construction, and Assistant Chief Engineer of the Chicago plant; Assistant Manager of the Link-Belt Indianapolis organization; and then Manager of their Ewart Works and Belmont Works, both located in Indianapolis.

### Pennsylvania Crusher Moves

Announcement is made by the Pennsylvania Crusher Company of the removal of its general office in Philadelphia from the Stephen Girard building to the nineteenth floor of the Liberty Trust building at Broad and Arch streets. The change was made January 1. The business which was started in 1897 by George W. Borton has enjoyed a continuous growth and inability to obtain additional space in the old location made the change necessary.



Western 6-yard dump car—standard gauge.

## Install Western Dump Cars for Increased Production

This is the car which many pits and quarries have installed to increase production—the Western 6-yard, two-way, side dump car. It is built standard gauge, strong, dependable and easily and quickly dumped by hand.

May we refer you to plants where Western cars are making good and explain why Western dump cars, whatever the size, can be depended on to keep shovel and crusher moving.

Write today. They have increased production for others, why not for you?

**Western**

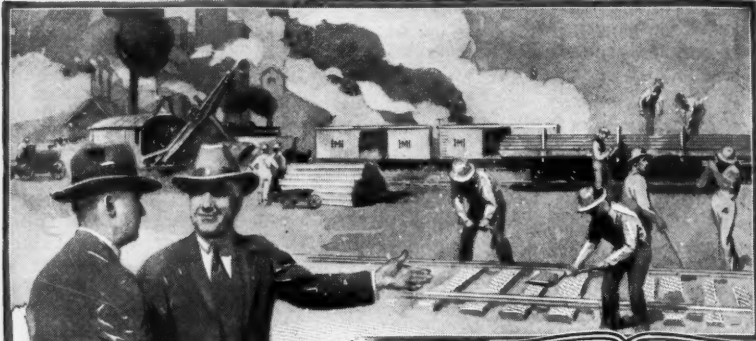


## Western Wheeled Scraper Company

*Founded 1877*

**Earth and Stone Handling Equipment**

**AURORA, ILLINOIS**



# Service

Realizing what a tremendous factor time is on many construction jobs, we have established storage yards at points from which we can make the quickest possible delivery of both rails and equipment to any part of the country. Purchasers of H-M rails or equipment, therefore, enjoy the fullest advantages of great speed and substantial savings in hauling charges.

We also maintain a corps of experienced rail men ready to go anywhere at any time in the service of those desiring to buy or sell. With Hyman-Michaels, no order is too large to handle — *none too small*. In fact, our great capacity has been developed through conscientious, helpful service to all classes of buyers.

We solicit inquiries, regardless of requirements, and *we invite rush orders*.

## Hyman-Michaels Company

Select Used Railway Equipment

Peoples Gas Building, Chicago

New York

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St. Louis

Pacific Coast Representative:

United Commercial Co., San Francisco

Seattle

Portland

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HYMAN  
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MICHAELS

Rails and equipment bearing the H-M stamp are invariably the choice of experienced buyers



We always have locomotives of every type in I.C.C. condition ready for immediate delivery at prices that mean big savings to the user.

Every engine in our yards has been overhauled, tested under steam and put in first class condition.

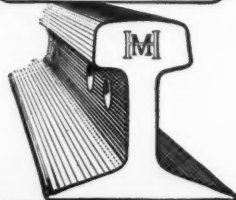
Road, Switch, Geared, Narrow and Standard Gauge Engines.

Write for prices and blue prints.



We always have ready for delivery cars of every type. Dump, Ore, Box, Flat, Refrigerator, Gondola, Hart Convertibles, Caboose and Passenger.

All in serviceable condition.





# Gas or Electric Hoists and Derricks

Available for immediate shipment f.o.b. New York, Chicago, Philadelphia, Pittsburgh

## GASOLINE OR ELECTRIC HOISTS

Large quantity American double drum hoists with attached swinging gear, capacity 6000 lbs. on single line at 162 ft. per minute with—new 55 H.P. Climax gasoline engine—37 H.P. 220 or 440 volt, 60 cy. 3 ph., A.C. electric motor—35 H.P., 220 volt, D. C. electric motor—or without power for belt drive  
 2—52 H.P. single drum Lidgerwood, with 220 volt, 60 cy., 3 ph. A.C. motor, complete with one winch head.  
 1—75 H.P. double drum Clyde concrete tower hoist, capacity 10,000 lbs. on rear drum, 5,000 lbs. on front drum, with 220 volt, 60 cy., 3 ph. motor.

## DERRICKS

Large quantity late model American Stiff Leg Derricks, mast 14x14x40 ft. booms 14x14x60 ft., stiff legs, 14x14x50 or 60 ft. sills if desired, with 12 ft. steel bull wheel, for hook work or bucket operation.  
 Large quantity late model American Stiff Leg Derricks, mast 16x16x40 ft., booms 14x14x80 ft., trussed with hog rods, legs and sills 14x14 with 16-ft. steel bull wheel, arranged for hook or bucket operation.  
 Also several Guy Derricks, wood or steel, arranged for single line work or for operating clam shell bucket.

## CABLEWAYS

11—3 and 5-ton, Street Bros. (Howson). Cableways, complete with automatic dump buckets.

## COMPRESSORS

1—2-stage, 950 ft. Sullivan, Class N.B. Compressor.  
 1—2-stage, 1,500 ft. Sullivan, stationary Compressor.

## CRANES AND SHOVELS

1—15-ton O & S, 8-wheel M. C. B., 40-ft. boom, bucket operating.  
 2—Type "B" Erie Shovels, mounted on caterpillars; one with Crane Boom.  
 1—O & S 7-ton Crane, 30-ft. boom, ¾-yd. clamshell bucket, traction wheels.  
 1—Byers Auto Crane, 30-ft. boom, ¾-yd. bucket, traction wheels, steam.  
 2—Thews on traction wheels, 1, Type A1, 1, Type 0.

## SPECIAL

2—Porter, oil burning, 6-wheel, with tender, cylinders 18x24, weight 105,000 lbs., on drivers, new July, 1925, equipped with Walschaert, electric lights, air brakes. Can be changed for coal burning at slight cost.  
 30—16-yd. Western Air Dump Cars, late model, vertical cylinder type.  
 2—Type "B" Erie Steam Shovels, on caterpillars, with crane booms, one equipped with fair leads for dragline work; new 1923 and 1924.

## CABLEWAY EXCAVATORS

1—Sauerman 1-yd. Cableway Excavator with 8½x10 double drum 2-speed hoist, with all necessary cable and sheaves for 1,000 ft. span.  
 2—Link-Belt Dull Cableway Excavator Buckets; one 1½-yd.; one 1-yd.

## BOILERS

3—Walsh Widener, 150 H.P. Boilers.  
 32—Upright Boilers, ranging in size from 30" in diameter by 60" high, to 48" diameter by 120" high. These boilers are suitable for mounting on concrete mixers, all high pressure. We have some boilers suitable for low pressure work, such as heating materials, at very low prices.  
 1—225 H.P. Bigelow-Manning, size No. 8. Vertical.

## LOCOMOTIVES

1—Davenport std. ga. 20-ton, 10x16 cylinders, saddle tank. No. 1497.  
 2—Porter std. ga. saddle tank, 14x22 cylinders, weight 42 tons, like new, only one year of service, shop Nos. 6768-6771.  
 3—7-ton, 24-in. ga., Plymouth, gasoline.  
 6—3-ton, 24-in. ga., gasoline. 3—Plymouth.  
 3—Whitcomb Fordson.

## STEAM SHOVELS

2—78-C Bucyrus, 1923 model, 30 ft. boom, 19 ft. dipper stick, 3-yd. dipper, on caterpillar. Shop No. 4001 and 4124.

## STEAM HOISTS

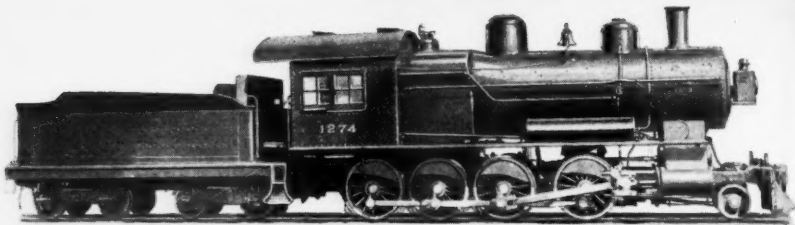
12—Three-Drum Hoists, with or without boilers. Sizes 10x12, 9x12, 9x10, 8½x10 and 7x10, with separate swinglers for derrick work. All makes.  
 54—Two-Drum Hoists, with or without boilers. Sizes 12x12, 10x12, 9x10, 8½x10, 7x10, 6½x10, 6x8, and 5x8. Can be equipped with holding drum for bucket work.

# Equipment Corporation of America

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 860 Empire Bldg.  
 Phone Grant 5148

CHICAGO, ILL.  
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- 3 Duplicate; 82-Ton; 20x26" Consolidation Type; Piston Valve; 200 Lbs. Steam; 48" Wheel Centers; Tractive Power 34,000 Lbs.; Thoroughly Overhauled; I. C. C.

**ALSO HAVE OVERHAULED AND READY—**

- 5—75-Ton; 20x26" Consolidations; 44" Wheel Centers; 190 Lbs. Steam; Tractive Power 33,590 Lbs.; I. C. C.  
 3—85-Ton; 20x26" 12-Wheel Consolidations; Piston Valve; 48" Wheel Centers; 200 Lbs. Steam; Tractive Power 34,000 Lbs.; I. C. C.  
 4—92-Ton; 21x28" Consolidations; Piston Valve; Wide Firebox; 200 Lbs. Steam; 50" Wheel Centers; Tractive Power 38,000 Lbs.; Some Outside Valve Gear; I. C. C.  
 1—125-Ton Shay Geared; 200 Lbs. Steam; Tractive Power 53,000 Lbs.; I. C. C.  
 1—60-Ton; 1924" 6-Driver Saddle Tank; New Asme Boiler in 1921.

**WILL EXCHANGE FOR LIGHTER POWER, ETC.**

*Have other equipment overhauled and ready*

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We turn into cash or trade all their idle equipment. Somebody, somewhere, wants and needs what you don't want. Don't matter where you are located, nor what kind of equipment—from a wheelbarrow up to a steam-shovel—that's our sole service—to find a buyer—and we do, if it's salable. We have hundreds of inquiries annually wanting to buy every conceivable kind of plant, from every part of the United States and Canada. We are making and saving thousands of dollars annually for our 25,000 satisfied listed members. Shall we add your name? Send today for complete details of our service.

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**NEW RAILS** RELAY  
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INCORPORATED  
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We Own and Offer for Sale Following Used **STONE QUARRY** Equipment, Which is Ready for Shipment:

**Gates Gyrotory Crushers**

- 1 No. 3
- 2 " 4
- 1 " 5
- 1 " 6
- 1 " 7½

**Ledgerwood Hoists**

- 3 Double Drum

**Incline Hoists**

- 2 Single Drum

**Revolving Screens**

- 1 18 ft. 40"
- 1 20 " 38"
- 1 14 " 38"

**Steam Shovel Dipper**

- 1—1 yd.

**Anaconda Rolls**

- 1 Type T-57-40"x15" Rolls

**Belt Conveyor**

- 1—40 ft. Centers

**Pit Cars**

- 20 Standard Gauge Steel Body

We shall be glad to furnish detailed information regarding above machines to those interested.

**MERCHANTS STEEL AND SUPPLY CO.**

208 South La Salle St.  
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**Hyman-Michaels Co.**  
Offers Another  
**HOIST**  
Bargain

**Exceptional Purchase Places Nationally-Known Lidgerwood and American Hoists on the Market**

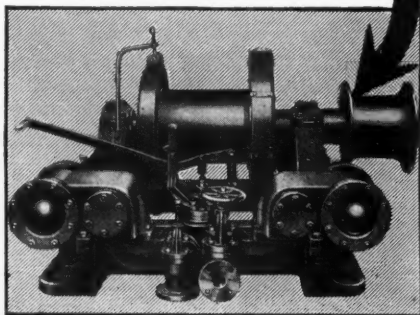
Less than one-quarter the regular price—that is our offer on these hoists. We bought them at a big reduction from their real value, and to dispose of them quickly we will sell them at

**\$195 Each, While They Last**

Both the 7x12 Lidgerwood and 8¼x8 American Hoists offered here are of the Two-Cylinder, Single-Drum type, with reverse throttle, single geared; hoisting capacity 5,000 and 10,000 lbs. For hoisting and pulling in mines, construction work, etc.; for use on ships, tugs, barges; for skidding, swinging, car pulling, etc.. These hoists are in constant demand. Our special bargain price while they last is only \$195.00 each, f. o. b. nearest shipping point. These hoists will be loaded from Chicago or St. Louis.

We also own and offer complete stocks of New and Relaying Rails, First-Class Locomotives, Ballast Cars, and a full line of Flat, Box, Refrigerator and Steel Hopper Bottom Cars and Cabooses in excellent condition and at attractive prices.

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**Kilns, Pulverizers, Air Comps.**  
**Crushers #10, 9, 8, 7½, 6, 5, 4, 3,**  
**Roll Crushers**  
**84x72, 36x60, 54x24, 18x30**  
**Jaw Crushers**  
 22x52", 36x48", 42x48", 20x24", 15x36"  
**DISC CRUSHERS, 48", 36", 24", 18"**  
**OIL ENGINES**  
 50-75-100-200-500-650 H.P.  
**3-3½ YD. SHOVELS**  
**2-200 H.P. MOTORS S RING**  
 440 v., 60 cy., 3 ph., 435 rev., G. E.

**Ross Power Equipment Co.**  
 13 South Meridian St., Indianapolis, Ind.

**STEAM SHOVEL**  
 1—MARION MODEL 21, full revolving, Shop No. 4952, new 1924, latest type ALL STEEL RIGID CATERPILLARS, ¾-yd. dipper; Boom 17 ft. 6 in.; Dipper Handle 12 ft. 6 in.; used less than four months, perfect condition.

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 1—TYPE B ERIE, full revolving Steam Crawler Crane. Shop No. 2600 new late 1923, ALL STEEL CATERPILLARS, A. S. M. E. boiler; 40-ft. crane boom, bucket operating; like new.  
 1—20-ton, 8-wheel, OHIO, Type "CD" Locomotive Crane, Shop No. 3631, new 1924, A. S. M. E. and Maass. boiler; 50-ft. boom; double drums, M. C. B. trucks used four months, guaranteed perfect condition.  
**Grey Steel Products Company**  
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**CABLEWAY**  
 800 ft. span cableway complete with Lambert engine.

**HOISTS**  
 5½"x 8" American D. C. D. F. D. with boiler.  
 7"x10" D. C. D. F. D. with boiler.  
 8¼"x10" Lidgerwood D. C. D. F. D. with boiler.

**AIR COMPRESSORS**  
 12"x10" Ingersoll-Rand Belted.  
 550 cu. ft. Ingersoll-Rand belted.

**BOILERS**  
 2—72" x 18' H.R.T. 140 lbs.  
 2—350 H.P. Heine water tube

**Wm. C. Johnson & Sons**  
**Machinery Co.**  
 1211 North 12th St. St. Louis, Mo.

**FOR SALE**

- 1—Figure 1531, 6x12 Form C Drive, Goulds Pyramid Pump, without motor. Capacity 114 gallons at 175' head.
- 1—Nordberg Butler Type Shovel, in first class running condition.
- 1—Flory double cylinder, double friction, steam hoist, list No. 37, 6¼"x 8". 12"x20" drums.

OWNED AND FOR SALE BY US  
**GRAY FOUNDRY, INC., Poultney, Vt.**

The Rock Plaster Corp. of New York Authorizes Us to Offer the Following Buhr Stone Mills

- Three 30" Horizontal Munson Mills, Belt Driven.
- Two 42" Horizontal Munson Mills, Gear Driven.
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Guaranteed Good Operating Condition.

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**For Sale—Reasonable**

- The following used 220 or 440 volt, A.C., 60 cycle motors.
- 10—3 H.P. Cleveland .....1200 R.P.M.
  - 3—5 H.P. Cleveland .....1800 R.P.M.
  - 3—5 H.P. Burke Continuous Duty .....1115 R.P.M.
  - 3—7½ H.P. Cleveland .....1800 R.P.M.
  - 1—20 H.P. Cleveland ..... 900 R.P.M.
  - 1—30 H.P. Cleveland .....1200 R.P.M.
  - 1—40 H.P. Western Electric. 900 R.P.M.
  - 4—50 H.P. Burke Slip Ring. 600 R.P.M.
- Small motors are ball bearing.

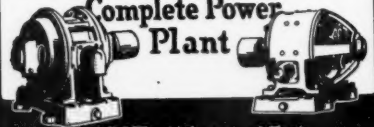
**THE DAY & MADDOCK COMPANY**  
 West 82nd Street, South of Denison Ave.  
 Cleveland, Ohio

**AIR COMPRESSORS**

- 92 ft. Ingersoll-Rand, ER-1, Belted.
- 355 ft. Ingersoll-Rand, ER-1, Belted.
- 355 ft. Ingersoll-Rand, FR-1, Steam
- 523 ft. Ingersoll-Rand, ER-1, Belt.
- 595 ft. Ingersoll-Rand, Imperial XB-2, Belted.
- 888 ft. Ingersoll-Rand, Imperial XB-2, Belted.
- 1190 ft. Ingersoll-Rand, Imperial XB-2, Belted.
- 1145 ft. Chicago Pneumatic OCB, Belt.
- 1400 ft. Chicago Pneumatic, OCB, Belt.
- 1500 ft. Ingersoll-Rand, Imperial XB-2, Belt.
- 1270 ft. Chicago, OCE Motor Driven, 3 phase, 25 cycle, 440 volt.
- 1308 ft. Chicago, OCE Motor Driven, 3 phase, 60 cycle, 2200 volt.
- 6—212 ft. Chicago Portable Oil Engine Driven Compressors.
- Portable Gasoline Driven Compressors.

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**A Fractional HP Motor or a Complete Power Plant**



**SAVE 35 to 45%**

Buy Properly Rebuilt Electrical Power Equipment

Every machine completely overhauled and tested - Guaranteed

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**Babbitts—Armature Metal—Pig Lead**

Tin: Spelter (zinc); Die-Cast Metal; Ez-Flo Solder; Special Alloys made to specifications.

Write, wire or phone for prices and information.

**KANSAS CITY WHITE METAL CO.**

**Mfrs. & Smelters**

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**CRUSHING ROLLS**

Two 16"x10", One 12"x24", Three 30"x10", Two 36"x16", Two 42"x16", and One 24"x54" Crushing Rolls. Swing hammer mills and other types.

**GYRATORY CRUSHERS**

Two No. 3 Gates, One No. 4 Gates, Two No. 5 Gates, Two No. 6 Gates & McCully, Two No. 7 1/2 Gates and Austin, Three No. 8 Gates & Traylor, One No. 9 Gates Gyratory Crushers.

**JAW CRUSHERS**

Three 9"x15", One 10"x20", Two 12"x24", One 15"x30", One 18"x36", One 24"x36", One 36"x42", and One 22"x50" Jaw Crushers.

**ROTARY CRUSHERS**

Three No. 1, Two No. 1 1/2 and One No. 2 Sturtevant Rotary Fine Crushers.

**DRYERS**

Two 3'x20', Three 4'x30', One 4 1/2'x30', One 5'x40', Three 5 1/2'x40', Two 6'x60', and One 7'x60' Direct Heat Rotary Dryers. One 5'x25', One 6'x30', Two 8'x8' Buggies Coles type "A" and one 4'x20' Buggies Coles type "B" Double Shell Rotary Dryers.

**KILNS**

One 4'x40', One 5'x50', Two 6'x60', One 6'x125', One 7'x60', One 7 1/2'x80' Rotary Kilns.

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**W. P. HEINEKEN & CO., Inc.**

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**Industrial Engineers**

**WANTED TO BUY**

7 1/2 ton Steel Stiff Leg Derrick with Steel Mast, Sills, Boom 100 ft. long, for clam shell bucket work. Give full detailed description with price f.o.b. Dubuque, Iowa. Also steam hoist and slewer to handle 1 1/2 yard Clam Shell Bucket. Prefer American Hoist & Derrick.

**LINEHAN & MOLO**

Dubuque, Iowa

**Wanted—JAW CRUSHER**

42"x48" Jaw Crusher, Manganese fitted; must be in first-class condition for operation. Give full details, price, and location in answer. Address Box 111, Pit and Quarry, 538 So. Clark St., Chicago.

**Wanted—JAW CRUSHER**

Size to be not less than 24"x36" and not larger than 42"x48". Must be in first-class operating condition. Give full details, price and location.

**PRESTON COUNTY COKE COMPANY**  
Cascade, West Va.

**CRANES—DRAGLINES—SHOVELS**

OHIO 30-T Loco. Crane, 50' boom, Clamshell. BUCYRUS 50-B, Cat. with dragline equipment. MARION 37 rigid crawling, 1 1/2 yd. dipper. MARION 21 Cat., 3/4 yd., 20' boom. (Shovels late models—Nos. near 5000.) MONIGHAN 3-T, 80' boom, 2-yd. Diesel. BUCYRUS Class 14 and 24 Steam Draglines.

**HOISTS AND DERRICKS**

AMERICAN wood stiff leg, 80' boom. Clam. TERRY steel guy, 115' mast, 100' bm. 15-T. MEAD-MORRISON No. 103 D. D., 80 HP Elect. MEAD-MORRISON No. 743, 3-D, 80 HP Elect. AMERICAN D.D., 40 HP., Electric. AMERICAN and MEAD-MORRISON Elec. Swingers.

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SAUERMAN 1-yd. outfit, steam, used 90 days.

**SAND AND GRAVEL PLANTS**

(Will sell items separately.)

1-yd. Elec. Cableway Outfit. Pumps, Pipe, Screens, Bins, Elevator, Motors, Crusher. Also River Plant including Dredge Boat, Tug Boat, 6 Barges, Engines, Etc.

**LARGE CRUSHING PLANT**

(Will sell items separately.)

Including Crushers, Screens, Conveyors, Elevators, Compressors, Drills, Drill Sharpener, Locomotives, Cars, Boilers, Engine, Hoists, Derricks, Pipe, Pumps, Etc.

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First Nat'l Bank Bldg. CHICAGO, ILL.

# T. H. LETSON & CO.

Good Hudson Terminal Bldg. Clean  
Used Sec'd NEW YORK Business  
Equipment Methods

## STEAM SHOVELS

- 1— $\frac{3}{4}$ -yd. type B Erie high lift, traction wheels.
- 1— $\frac{3}{4}$ -yd. type B Erie No. 1566 on Caterpillars.
- 1— $\frac{3}{4}$ -yd. type B Erie No. 1769 on Caterpillars.
- 1— $\frac{3}{4}$ -yd. Al Thew on Traction Wheels.
- 1—No. 4 Keystone Excavator No. 4296, with skimmer scoop and trench bucket.

## HOISTS (Steam)

- 1—7x10 single drum, Skeleton Lidgerwood.
- 1—8 $\frac{1}{2}$ x10 three drum and boiler Lambert.
- 1—10x12 D. D. and Swinger Skeleton Lidgerwood.

## HOISTS (Electric)

- 1—22 H.P. two drum Flory with 2Ph. 60C. 220V. Motor and Solenoid brake.
- 30—Separate Clyde Electric Swingers with 10 H.P. 3Ph. 60C. 220V. Motors, or without Motors.

## DERRICKS

- 1—10 ton 80' boom 14"x14" Terry Timber Stiff Leg with 12' Bullwheel.
- 1—20 ton 70' boom Steel Guy (Erector's type.)

## FOR SALE

One Oxweld Portable Low Pressure Type Acetylene Generator, 35 pound carbide capacity. The Generator is good as new, having been in use only one week. Address

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## RAILS

All sections, new and second hand rail; also portable track. Centrally located. Also Cars of all kinds.

Immediate shipment guaranteed

M. K. Frank

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ALL WEIGHTS AND SECTIONS  
FROGS, SWITCHES, TIE PLATES

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Any Quantity—Immediate Shipment

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Steel Ties—Frogs—Switches, Etc.

## RAILS

SWITCHES AND FROGS  
LOCOMOTIVES AND CARS

L. A. Green Railway Equipment Co.  
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## FOR SALE

Model 60 Marion Steam Shovel, R.R. trucks, 2 $\frac{1}{2}$  yd. dipper, located Delaware, Ohio. Rebuilt at cost of \$3,500.00, and not used since. Bargain price.

Estate of A. T. Baldwin  
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## FOR SALE

- 1—No. 7 $\frac{1}{2}$  Austin Crusher, chilled iron fitted.
- 1—Model 60 Marion Shovel No. 1493.
- 1—Model 80 Marion Shovel No. 801.
- 1—Model 70 Bucyrus Steam Shovel.
- 1—Model "O" Thew Revolving Shovel.
- 1—1-yd. Vulcan Revolving Shovel.

THE CASPARIS STONE COMPANY  
302 Yuster Bldg., Columbus, Ohio

## CRUSHERS

- 1—No. 4 $\frac{1}{2}$  Champion jaw, manganese jaws, almost new, special bargain, 100 car loads dependable used machinery in stock.

HACKLEY MORRISON  
Richmond, Va.

## For Sale

10 Ingersoll-Band X-70

## Rock Drills

50% of new price

ARCHER ARMSTRONG, INC.  
Grand Central Terminal Bldg.  
New York City

## BOILERS

3-200 H.P. Scotch boilers, 160 lb. pressure, corrugated furnaces, portable, economical, no brick setting needed. Large stock used equipment. Cars, rail, crushers, locomotives, pipe, screens, hoists, etc.

HACKLEY MORRISON CO.  
1708-1722 Lewis St., Richmond, Va.

## COON SKINS—AXE HANDLES— POSSUM HIDES

Taken in trade on

Steam Shovels—Locomotives—Cars  
New and Used by

DEMPSTER EQUIPMENT COMPANY  
Dempster Bldg. Knoxville, Tennessee  
Branches all over the South

## FOR SALE

4—Sturtevant Ring Roll Mills

For further particulars address

NATIONAL CEMENT CO.  
Bogland, Ala.

## 50 Ton Capacity HOPPER BOTTOM STEEL ORE CARS

A-1 condition. Ready for service. Bargain

DULUTH IRON & METAL CO.  
Duluth, Minnesota

# USED EQUIPMENT BARGAINS

PIT AND QUARRY 119

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- 1—36x48" Traylor Jaw, manganese fitted.
- 1—No. 8 Style "K" Gates, chilled iron fitted.
- 1—24x36" Farrell Jaw.
- 1—No. 5 Austin gyratory.
- 1—No. 5 "K" Gates, two heads.
- 1—Traylor No. 3 gyratory.
- 1—McCully No. 3, gyratory.
- 1—9x15 Blake type Jaw Crusher.

## CRANES

- 1—Northwest Model 104, combination Shovel.
- 1—O. & S. 12 ton, full caterpillar, gas, 40 ft. boom, 10 ft. extension.

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- 1—Model 103 Bucyrus, caterpillar, extra R.R. trucks.
- 1—Marion Model 37, caterpillar.
- 1—Marion Model 36, caterpillar.
- 1—Marion Model 32, caterpillar.
- 1—Marion Model 31, caterpillar.
- 1—Marion Model 28, combination crane.

**BOLL MACHINERY COMPANY, Not Inc.**  
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## WINTER BARGAINS—CRUSHERS

- 1—N. 9 and 4 Teismith Plant Complete.
- 1—No. 20 Superior type McCully used few moe.
- 1—No. 9 Gates Style K with manganese fit.
- 1—No. 8 Gates Style K used two years.
- 2—No. 7 1/2 Gates Style K used five years.
- 2—No. 6 Gates Style K used six years.
- 1—No. 5 Gates Style K, New.
- 1—No. 4 Gates Style K, manganese fit.
- 2—No. 3 McCully in perfect condition.
- 1—42x48 Allis-Chalmers Jaw Type mang. fit.
- 1—24x36 Farrell Style B mang. fit.
- 1—30x36 Farrell Style B mang. fit.
- 1—36" Sym ons Disc Crusher style C with parts.
- 1—Symons 48" Style C; A-1 Condition.
- 1—Symons 48" Vertical Brand New.
- 1—Dixie Hammer Mill Brand New.

Also others of smaller sizes. I have Elevators, Screens, Hoists, Cars, Cranes, Compressors, Draglines, Blast Hole Drills, Track and all other Quarry Equipment to go with above.

**GEORGE C. MARSH**  
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## FOR SALE

- 2—Norwalk Air Compressors direct connected to 12x12 Norwalk Steam Engine. Compressor as follows:

- Low 11 1/2 x 12
- High 7 1/2 x 12
- Low 11 1/2 x 12
- High 5 1/2 x 12

This equipment is brand new and is on original skids. Price \$1,000.00 each f.o.b. cars.

**OKLAHOMA HIGH LINE CONSTRUCTION CO.,**  
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- 30x36 Farrel Jaw Crusher.
- 15x36 Blake Jaw Crusher.
- 12x26 Champion Jaw Crusher.
- Allis-Chalmers 48"x20" screen.
- 110' Robbins Conveyor with 30" belt.
- Elevators, Wet Pans, Dryers, Etc.
- 3—Newaygo Screens or separators.
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- Davenport 21-ton Locomotive, 165 lb. pressure.
- Plymouth 8-ton and 6-ton, 36" ga. Locomotives.
- 1—Atlas 109'x7' Rotary Kiln, complete.
- 2—Atlas 60'x6' Rotary Kilns complete.
- 15-ton Browning Locomotive Crane, 45' boom.

## Central Equipment Co.

602 OWENS BLDG., DETROIT, MICH.

## FOR SALE

- 1—Sauerman Slackline Cableway Excavator, 2-yd. capacity, 110 ft. Steel Mast, Clyde Double Drum Engine and Boiler complete and practically new.
- 1—50-ton American Locomotive Standard Gauge.
- 1—200 H.P. Scotch Marine Boiler.

## THE M. A. CALLAHAN CO.

1309 Schofield Bldg., Cleveland, Ohio

## STEAM SHOVELS

- 1—Model 60 Marion.
- 1—Model 70 Marion.

## CRANES

- 1—18-ton O. & S.
- 2—20-ton Brownings.
- 2—30-35 ton McMylers.
- 1—30-ton Ohio.

## CARS

- 40—12-yard Western Air Dump.
- 10—16-yard Western Air Dump.

## LOCOMOTIVES

- 2—7-ton Fate Gasoline, standard gauge.
- 2—55-ton, six-wheel switchers.
- 4—18-ton, 36" gauge Vulcans.

Let Us Have Your Inquiries  
**Harry Kleinhans Company**  
Union Trust Bldg.,  
Pittsburgh, Pa.

## FOR SALE

- 1—18B Bucyrus Shovel, on traction wheels. Shop No. 2053.
- 1—No. 20 Superior Type McCully Crusher. Located Olive Branch, Ill.
- 1—25-ton Davenport std. ga. Saddle Tank Locomotive.

**H. A. COOLEY**  
3411 S. Oakley Ave., Chicago, Ill.

## UNUSUAL VALUES FOR QUICK SALE

- 2—300 H. P. Erie Water Tube Boilers, 175 lb. pressure, 135 ft. stack, first class condition ..... \$2500.00

- 1—Steam Plant consisting of:
- 2—150 H.P. Walsh and Weldner Boilers.
- 1—150 H.P. Jackson Corliss Engine.
- All fittings ..... \$2850.00

- 1—300 H.P. Water Heater.
- 1—Alternator.

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**MILLS EQUIPMENT CORPORATION, 1222 Volunteer Bldg., CHATTANOOGA, TENNESSEE**

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I have a concrete gravel plant with some equipment two miles from city limits. Output can be sold at pit. Will either sell outright or on royalty basis. Present owners acquired holdings with idea of only financing, but had to take over management, and other interests make it impossible to do this.

**WM. E. BARNES**  
**Care of Wm. E. Barnes, Inc.**  
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### WANTED

- 1—Overhead Crane from 40 to 50 ft. span.
- 1—6-yd., 2-way, Dump Cars.
- 1—¾-yd. Gasoline Crane, combination on caterpillars.

Want a big pair of shears for junk yard.

**H. A. COOLEY**  
3411 S. Oakley Ave. Chicago

- 2—4 Drum McMyler Shaft Hoists.
- 3—1-R Compressors, 1190 ft. belt dr.
- 1—7-E Dake Hoist, 30 H.P.
- 5—12 Yd. Std. Gauge Dump Cars.
- 5—4 Yd. 36" Gauge Dump Cars.
- 5—12" Centrifugal Pumps.

**J. T. WALSH**  
500 Brisbane Bldg., Buffalo, N. Y.

### Released Quarry Equipment

- 70 Ton Bucyrus E.R. Wheels.
  - No. 8 Superior Gyrotory Crusher.
  - No. 5 Austin Gyrotory Crusher.
  - 2—14 Ton 9"x14" Porter Dinkies.
  - 5 Yd. Heavy Duty Steam Shovel Dipper.
- We want to move this equipment and are making prices that will do it.
- LEHIGH STONE COMPANY,** Kankakee, Ill.

### FOR SALE

- 1—No. 40 Stedman Disintegrator.
- 1—Sturtevant Vibrating Screen.

**BRYN MAWE SAND AND  
GRAVEL CO.**  
131 Holden Street, Minneapolis, Minn.

*If what you want is*

*not advertised  
write*

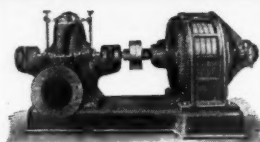
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538 S. Clark St., Chicago

## HYDRAULIC DREDGES 6" to 12"

Designed and Built

**RANDOLPH-PERKINS  
COMPANY**  
38 South Dearborn Street  
CHICAGO



Single  
Stage  
High  
Head  
High Ef-  
ficiency  
Centrif-  
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Capacities 25 to 4,000 Gal-  
lons per minute.

**Pumps for All Purposes  
ECONOMY PUMPING  
MACHINERY CO.**

Offices, 88-120 No. Curtis St., Chicago, Ill.  
Works, 91-111 McDonough St., Joliet, Ill.

TRADE MARK  
**MUNDY**  
ESTABLISHED 1869

Steam—Electric—Gasoline  
**HOISTING EQUIPMENT**



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174 page Mundy  
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30 Church St., New York, N. Y.

## MUNDY HOISTS

## Toepfer Products

REVOLVING SCREENS  
SCRUBBERS  
ELEVATORS  
FEEDERS  
GRIZZLYS  
CONVEYORS  
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**W. TOEPFER & SONS CO.**  
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Jackson and Canal St.  
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**St. Mary's Oil Engine Co.**  
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Manufacturers of Diesel Oil Engines from  
9 H.P. up to and including 120 H.P.

## QUARRY CAR EQUIPMENT



THE ATLAS CAR & MANUFACTURING CO.  
Cleveland, Ohio

## REPRESENTATIVES WANTED

Michigan Manufacturer wants representatives to handle a well established line of Hoists, Motors and Pumps. Line is high grade and well advertised. Good proposition to capable and experienced men.

Address Box 103, Pit and Quarry  
538 S. Clark St., Chicago, Ill.

**Perforated Metals and  
Screens of All Kinds**

Material in Stock  
Prompt Shipment

Chicago Perforating Co.  
2435 West 24th Place  
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Tel. Canal 1459

**Owen Buckets**  
INSURE A BIGGER DAY'S WORK



### GUARANTEE

*Owen Clambell Buckets are absolutely guaranteed to do more work than any other bucket of the same weight and capacity.*

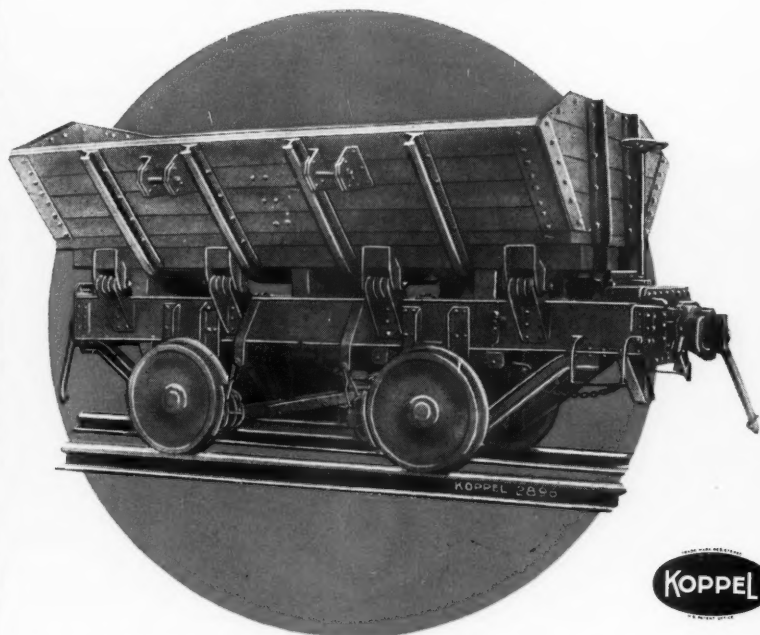
**THE OWEN BUCKET COMPANY**

508 Rockefeller Building Cleveland, Ohio

Offices: Los Angeles, Miami, Ft. Lauderdale, New York, Philadelphia, Portland, St. Louis, San Francisco

# A POPULAR CAR!

## The Koppel 2896



**KOPPEL**

### PAN TYPE QUARRY CAR WITH WOOD BODY, STEEL REINFORCED

11 Cu. Yd. Capacity for 4' 8½"

This car has a thick white oak body, steel reinforced and strengthened at every vulnerable point—a quality car throughout.

Quarry operators are finding this type of car to be ideal from a standpoint of service, increased production and low maintenance cost.

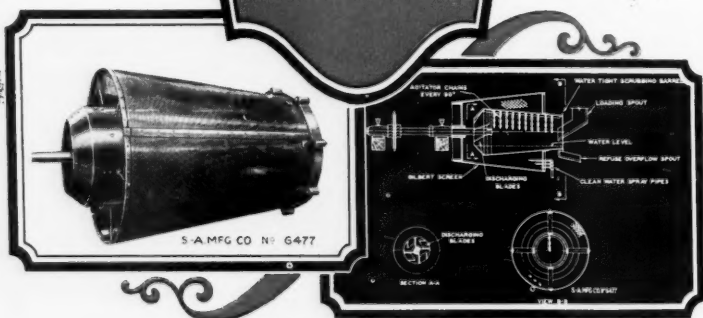
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**Koppel Industrial Car & Equipment Co.**  
Koppel, Penna.

Sales Offices  
Pittsburgh      New York      Chicago      San Francisco

**RAILS—SWITCHES—FROGS—TRACK**

**MORE**  
*and*  
**CLEANER**  
**GRAVEL**



## THE GILBERT SCREEN AND SCRUBBER

This ingenious new combination brought out by the S-A Engineers is the most successful equipment at present for scrubbing aggregate and making one separation. It consists of a scrubbing barrel inside the already popular Gilbert Screen. Material is delivered to the inside of the water-tight scrubber-barrel where short lengths of chains fastened at 90 degree intervals agitate the material and with the water loosen and remove the dirt.

When the material reaches the end of the tube, fixed blades discharge the aggregate to the inside of the Gilbert Screen for final washing and the first separation.

### Stephens-Adamsen Mfg. Co.

Main Office and Plant—Aurora, Illinois  
Pacific Factory Branch—Los Angeles, California

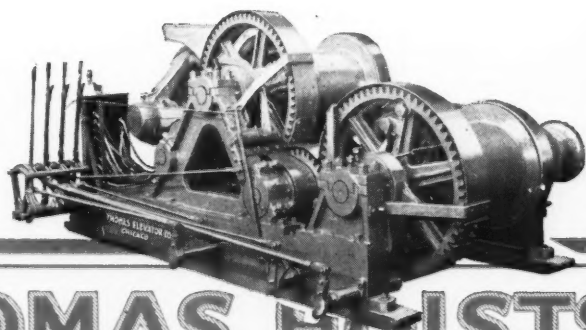
# *A Specialized Hoist is a Better Hoist—*

Thomas Hoists are specialized hoists and are the result of many years of experience in the sand and gravel industry. They are built in sizes ranging from 30 to 200 horsepower, both single and two speed types and can be furnished with electric, gasoline or steam motive.

Thomas Hoists have established many tonnage records in the production of sand and gravel and are the choice of producers who are familiar with their superiority.

THOMAS ELEVATOR  
COMPANY

21 South Hoyne Ave., Chicago



## THOMAS HOISTS



### Why The Superior Portland Cement Co. Replaced "Coyote Holing" With Big Blast Hole Drilling

THE Superior Portland Cement Company of Concrete, Washington, have a typical West Coast mountainside quarry. The face is high, now ranging from 150 to 250 feet and it will increase in height rapidly due to the steep slope of the hill which makes the quarry top. The face is approximately 1,00 feet long and the required capacity of the quarry is 2000 tons per eight hour day. The limestone formation is hard and full of pockets and seams. The stratification is somewhat irregular, dipping for the most part, towards the quarry face.

The coyote hole or tunnel method of blasting as used for a number of years was unsatisfactory for the following reasons: High primary explosive costs; the difficulty in reaching the top of the face with explosive action, causing huge blocks of stone to be set out that required bull dozing and resulting in de-

lay and danger to both men and shovels; the danger of rock slides and the uneven quarry floor.

The company realized the economies of well drill or big blast drill operation but were hesitant in trying the system because of the one time failure of a well drill to put holes down through the seamy rock.

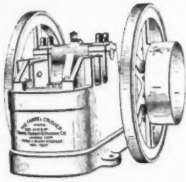
In January, 1925, a Cyclone No. 14 Super Electric Traction Drill was placed in the quarry on a basis of guaranteed results. In May a second machine was purchased. These drills are equipped with 8 inch bits and 5 inch by 20 foot drill stems—a tool equipment weighing nearly a ton. The company reports that although the drills have been working under adverse conditions due to back breaks from previous tunnel shots, they have not failed in a single instance to put the holes down the required depth.

Write for our 120-page book, "Big Blast Hole Drills"

**The Sanderson-Cyclone Drill Co.**  
Orrville, Ohio

## "FARREL" CRUSHERS

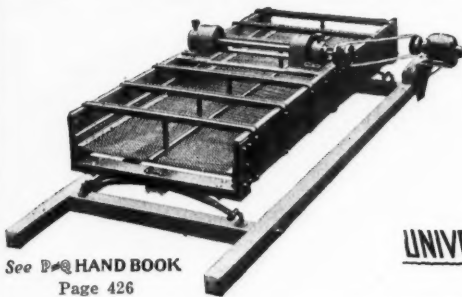
—World Famous—



Thousands in use on the hardest rock. Built in all sizes, 6"x3" to 60"x48". Complete rock crushing plants designed and equipped, also sand and gravel, washing and screening plants.

Send for latest bulletin E.

**Earle C. Bacon, Inc., Engineers, 26 Cortlandt St., New York**



See P. & Q. HAND BOOK  
Page 426

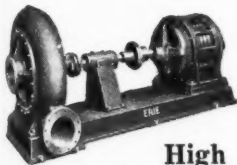
### Universal Vibrators

For the very highest screening efficiency with the lowest maintenance cost.

Write for Descriptive Catalog  
Today

**UNIVERSAL VIBRATING SCREEN CO.**  
RACINE -- WISCONSIN

## Erie Dredging Pumps



For Sand  
and  
Gravel.  
Powerful  
Suction.

High  
Water Velocity

**ERIE PUMP & ENGINE WORKS**  
153 Glenwood Ave., MEDINA, NEW YORK



FOR any kind of operation in sand, gravel, rock or other pit material where uninterrupted day-in-and-day-out production is a vital factor you can always depend upon

# Marion

*Power Shovels*  
Electric-Steam-Gasoline-Electric

For full particulars regarding all types and sizes, write to shovel headquarters



**MARION STEAM SHOVEL CO.**  
Marion, Ohio

G.L.I.

**BAY CITY**  
ONE MAN CONVERTIBLE  
**EXCAVATOR**

**BAY CITY DREDGE WORKS**  
BAY CITY, MICH.

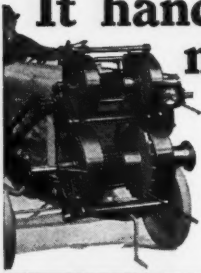
**Waiting For  
Your Request**

You should have this new catalog describing the "one man" excavator. The industry's popular HALF YARD Shovel-Crane.

See Ad. last issue and P.&Q. Hand Book

**BAY CITY DREDGE WORKS**  
Bay City, Mich.

**It handles stone, sand and gravel more economically**



This new hoist cuts the cost of material handling immensely in sand and gravel pit and quarry work. It operates drag line scrapers and furnishes quick, cheap power for all kinds of hoisting and pulling operations. Being automotive, it goes anywhere under its own power. Completely controlled from Fordson driver's seat. Write for free Hoisting Manual.

Willamette Iron & Steel Works,  
Portland, Oregon, U. S. A.

**Allison**  
AUTOMOTIVE  
**HOIST**

For the Fordson

**BUILT BY WILLAMETTE**

Crushing and Grinding

Material Handling

Old Equipment Modernized

Properties Examined

**C. H. SONNTAG**

*Engineer*

Cape Girardeau, Mo.

Portland Cement Plants

Electric Power Transmission

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**For Separating Dry Ground Materials**

80 Mesh to 350 Mesh

**GAYCO CENTRIFUGAL SEPARATORS**

Six Sizes—30 Inch to 14 Feet Diameter

RUBERT M. GAY COMPANY, Inc. 114 Liberty St., N. Y.

**McGANN MANUFACTURING COMPANY, INC.**

Engineers and Manufacturers

CHICAGO

YORK, PA.

NEW YORK



**THE SCHULTHESS HYDRATOR**— Built in all sizes to suit condition—Takes lime direct from the Kiln without crushing—lowest possible power required, about one-third the amount used by other Hydrators—Entire elimination of dust problem. Put your Lime Problems up to us.



**YORK**  
Kilns

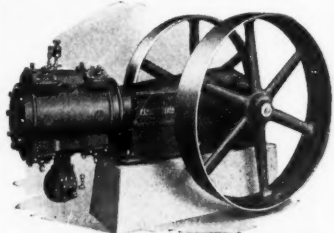
**SCHULTHESS**  
Hydrators

**YORK**  
Double Shell Dryers



**LUDLUM**  
**Tool Steel**  
**Utica**

THE MASTER HEAVY DUTY STEEL FOR PRESS TOOLS, COPPLICA, "B" SHAPE, TAPS AND REAMERS. WRITE FOR OUR INTERESTING BULLETIN ON TOOL STEELS.  
**LUDLUM STEEL COMPANY**  
 WATERVALET - N.Y. - U.S.A.  
 WE HAVE A SPECIAL TOOL STEEL FOR EVERY SPECIFIC PURPOSE.

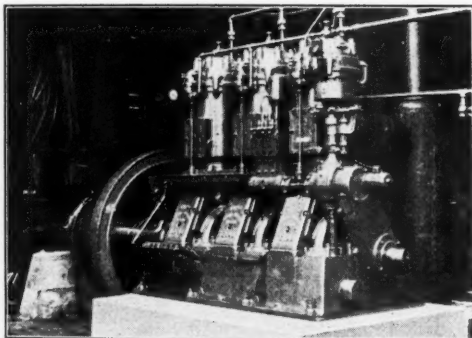


**PENNS  VANIA**  
**AIR COMPRESSORS**

The importance of selecting an Air Compressor that is always on the job, faithfully performing the service for which it was purchased, cannot be overstressed.

*Ask for bulletin 123-P*

**PENNSYLVANIA PUMP & COMPRESSOR CO.**  
 MAIN OFFICE AND WORKS, EASTON, PA.



**TIPS OIL ENGINES** burn low grade fuels. Solid Injection. 40—165 H.P. Sizes suitable for operating dragline excavators, hydraulic dredges and all stationary work. Variable speed, 100% water-cooled heads, no torches, Chrome-Vanadium crankshafts.

*Write for Bulletin J-2*

**TIPS ENGINE WORKS**  
**AUSTIN, TEXAS**

*Agents in all principal cities*

**Advertise Your**  
**“Wants” and**  
**Surplus**  
**Equipment**

**Patents Secured to Protect**  
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**Royal E. Burnham**

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**Continental Trust Bldg.,**  
**Washington, D. C.**

**TRADE MARKS**

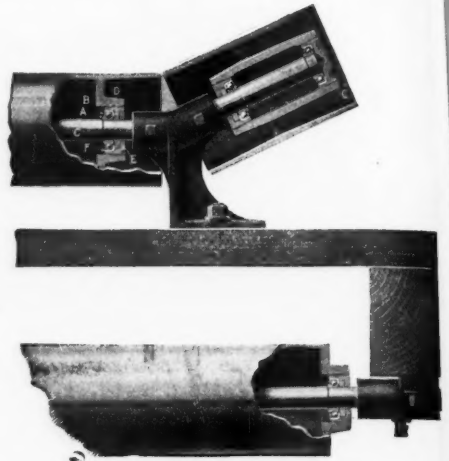
## Less Friction—More Volume in Your Conveyor

Conweigh Ball Bearing Idlers on your conveyor will reduce friction to a minimum, thereby saving power and giving you a maximum volume.

We have solved this costly and bothersome problem for many operators by installing Conweigh Ball Bearing Troughing and Return Idlers. They are of correct design and durable hardened steel construction.

Easy to lubricate, they overcome the ordinary conveyor difficulties.

Write us for information.

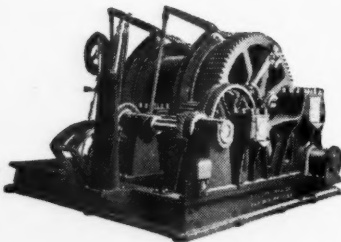


### THE CONVEYING WEIGHER COMPANY

90 West Street

ENGINEER & CONTRACTOR

New York



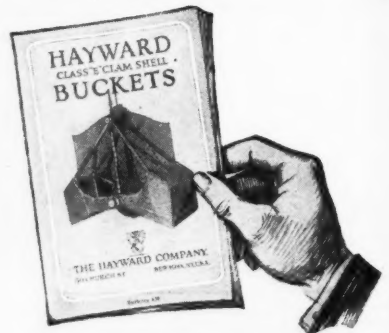
**F**lory Hoists are dependable, rugged, and very efficient in operation. There is a Flory Hoist for every purpose. Use one on your next job.

Write for our latest catalog—we'll gladly send it to you. Flory engineers will assist you with any hoist problems.

Agents in Principal Cities

**S. FLORY MFG. CO.**  
Bangor, Penna.

## Hayward Buckets



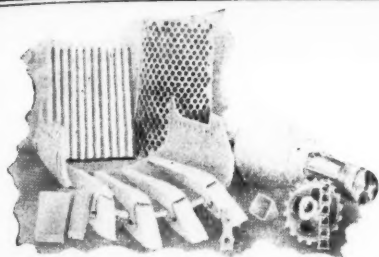
Another new Hayward Bulletin. This pocket size bulletin completely describes three types of Hayward Clam Shell Buckets. Just ask for Bulletin 650.

**THE HAYWARD COMPANY**  
54-56 Church St. New York, N. Y.

Builders of Clam Shell, Orange Peel, Drag Line and Electric Motor Buckets; Dredging, Exca-



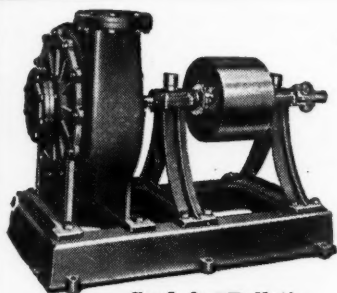
vating, and Coal Handling Machinery; Counterweight Drums; Automatic Take-Up Reels.



Manganese Steel has become a general specification that covers a wide range of material. TISCO Manganese Steel is a product of proven quality that has established the standard for comparative value.

*Ask the Machine Builder for it*

**TAYLOR WHARTON IRON & STEEL CO., HIGH BRIDGE, N. J.**



Send for Bulletin

## The PUMP Was Right

*The Western Bridge Company writes:*

"We were in error in making complaint against the 4 inch pump you sold us at Noel, Missouri.

The bolts had failed to be tightened in several places and caused unnecessary air leaks. The mechanic on the job found these loose bolts and after tightening them, the pump works perfectly."

**KANSAS CITY HAY PRESS CO.  
KANSAS CITY, MISSOURI**

The WILLIAMS

**digs  
more**

**in a day  
or in a  
month**

**—because**

the extra power of its *straight-line* closing pull gives a faster bite into the material, and shorter cable because its

overhaul speeds up both the opening and closing.

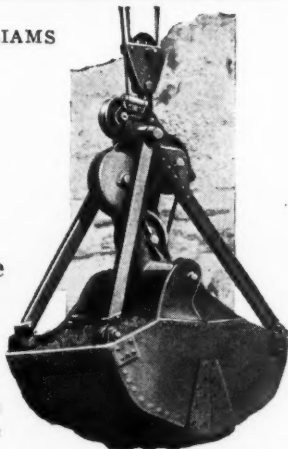
Write us for a description of a WILLIAMS Bucket that will give the results you need.

**G. H. WILLIAMS COMPANY**

605 Haybarger Lane, Erie, Pa.

Eastern Sales Office: 30 Church St., N. Y. City

**WILLIAMS**  
FAST-DIGGING BUCKETS  
All Parts Guaranteed Against Breakage



## Keystone Lime Kilns

Built for heavy duty and continuous operation.

Capacity standard size, 100 to 160 barrels per 24 hours.

Wood,  
Coal,  
Oil, or  
Gas Fuel.



**Stacey-Schmidt Mfg. Co.,  
York, Pa.**

New York Chicago Salt Lake City



## Satisfaction— For You and Your Customers

If your product is right it will bring satisfaction to both you and your customers.

Clean sand and gravel will satisfy the most exacting customer and will also bring you a greater profit.

Perfect Classifiers will produce clean materials at all times.

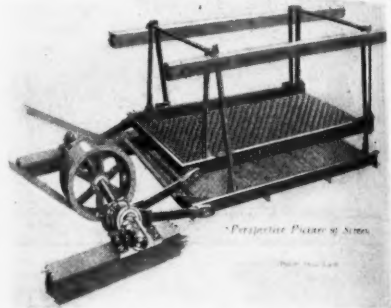
The above photograph illustrates an installation on the dredge of T. L. Herbert & Sons Co., Nashville, Tenn., where Perfect Classifiers are again giving satisfaction.

Write for full information

**PERFECT CLASSIFIER CO.**  
105 First Ave., South  
Nashville, Tenn.

## SEAVERNS' BALANCED SHAKING SCREEN

Produces Clean, Uniform Size Stone



The Seaverns Screen is so designed that the horizontal weight of the top deck balances the weight of the lower deck. These two weights traveling in opposite directions balance themselves, thus overcoming vibration on the supports due to the high speed of the screen.

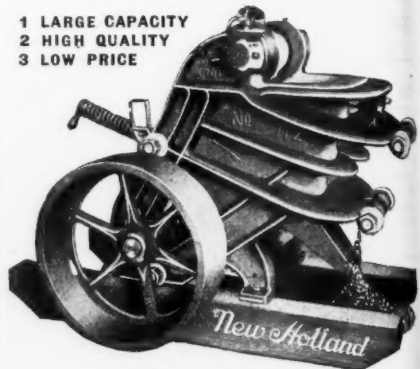
Connecting rods are of 1-in. flat steel bars, 5-in. wide, provided with a cast steel pitman with a split bronze bushing to take up wear at the outer end.

You will not regret buying a Seaverns Balanced Shaking Screen when particular customers will demand clean uniform size stone. Send for "dope".

**James B. Seaverns Company**  
Engineers, Manufacturers  
1315 South Oakley Avenue, Chicago

## RESULTS TESTIFY =New Holland= Jaw Crushers Mean Economy

- 1 LARGE CAPACITY
- 2 HIGH QUALITY
- 3 LOW PRICE



WRITE FOR CATALOG

**New Holland Machine Co.**  
Franklin St., New Holland, Pa.

# The HUSKY DREADNAUGHT

## A High-Powered Clamshell

More power to you if you operate with a Blaw-Knox Dreadnaught Bucket, because it is built for **power**. It will work with equal facility in general service or hard digging because it is built from the huskiest materials by **Master Bucket Builders**. And it is *Absolutely Guaranteed*.

**BLAW-KNOX CO.**

652 Farmers' Bank Bldg., Pittsburgh, Pa.

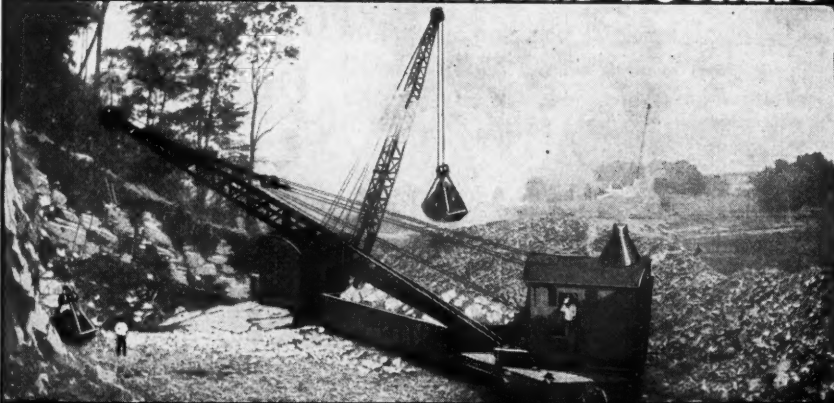


# BUCKETS

ABSOLUTELY GUARANTEED

# BROWNING

## LOCOMOTIVE CRANES AND BUCKETS



**The Browning Crane Company**  
16226 Waterloo Rd., Cleveland, O.

# SALEM

Genuine

## Elevator Buckets

Since 1880, when Salem Buckets were awarded First Premium for superiority, no other make of bucket has approached the Salem in quality, long wear and unusual service. It is made in many different sizes and gauges of steel ranging from 24 gauge to 6 gauge, and is adaptable for handling materials of practically any size, shape or weight. Our ability to furnish special buckets made up in accordance with your specifications enables us to offer excellent service and prompt delivery.

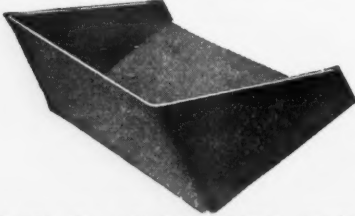


FIG. 131—Square Heel Shelf Bucket. For handling damp materials which will not discharge readily from other styles of buckets.

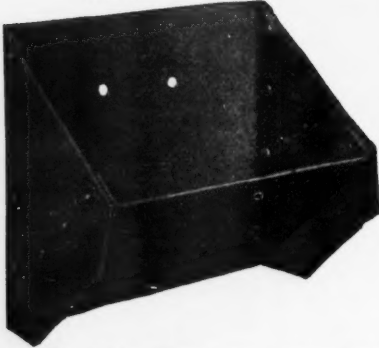


FIG. 278—Flaring Trough Front Elevator Bucket. A heavy duty steel bucket used for a variety of service conditions. Pours its load instead of throwing it, assuring perfect discharge at low speeds.



FIG. 196—Low Front. For handling damp substances that will not discharge easily from the regular depth bucket.

Write for Catalog 3625

**MULLINS BODY CORP.**

Successor to  
**W. J. CLARK CO.**

106 Mill St.,

Salem, Ohio



FOR  
DRAG LINES  
POWER SHOVELS  
DERRICKS

**AMERICAN  
STEEL & WIRE  
COMPANY**

Chicago

New York

# "DOMESTIC"

(Reg. U. S. Pat. Off.)

## Portable Air Compressors



The use of an Air Compressor, as illustrated, saves unlimited time and money, both by being easily moved from one job to another, and by delivering the necessary pressure when wanted. The engine and compressor are built as an integral unit, and combine the fewest possible moving parts with highest mechanical efficiency. The Compressor here shown has a 184 cu. ft. capacity and is mounted on rubber tired trailer.

*Let us send you Bulletin "AP" giving full particulars*

**Domestic Engine & Pump Co.**  
Manufacturers  
SHIPPENSBURG, PENNA.

DEPENDABLE



POWER UNITS

## SPEARWELL MOGUL LOADER

**A Strictly One Man Machine**

**CAPACITY 1½ to 2½ CU. YDS. PER MINUTE**

**Weight 14,000 lbs.**

Equipped with positive and efficient excavating, feeding and cleanup device.

Clears path 8 feet wide.

Guaranteed to excavate harder material and to clean up better than any loader of its kind on the market, bar none.

40 H.P. 4 cyl. Heavy Duty Buda Motor.

Positive self-cleaning track. 1500 square inches of bearing surface, less than 10 lbs. per square inch.

Digging and crowding speeds 4 and 20 ft. per minute. Traveling speeds ½ to 2½ miles per hour.

Digging position quickly and easily adjusted and absolutely maintained by special grade control shoe.

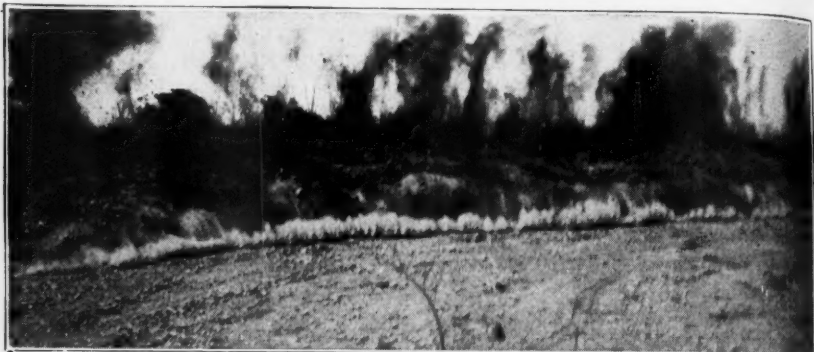
Swivel chute controlled from operator's platform, permits loading in any position.

*Write for literature and prices on Spearwell Loaders—a size for every need.*

**SPEARS-WELLS MACHINERY CO.**

Manufacturers of **SPEARWELL CONSTRUCTION EQUIPMENT**  
Oakland, California





Quarry face 1,600 feet long and 50 feet high being broken up by means of explosives detonated with Cordeau-Bickford

For one or for two hundred drill holes, use the safe, sure, and efficient detonating agent, Cordeau-Bickford. Even though you have no power line, you can still shoot any number of holes you desire by using Cordeau-Bickford. Write for booklet today.

## The Ensign-Bickford Company

Original Manufacturers of Safety Fuse

Established 1836

SIMSBURY, CONNECTICUT

### GRUENDLER PULVERIZERS

run right along, day after day, without attention. They are a delight to operators. Their low operating costs per ton of production and their uniform quality mean economy, better prices and more business for you.

This is Gruendler Performance. Gruendler Pulverizers are built in stationary and portable types, with capacities of from 1 to 15 tons per hour. You should investigate this dividend paying proposition.

Let us send you our descriptive literature.



## A Little Oil Now and Then

**GRUENDLER** PATENT CRUSHER & PULVERIZER Company  
FIRST & FRANKLIN ST. LOUIS, MO.

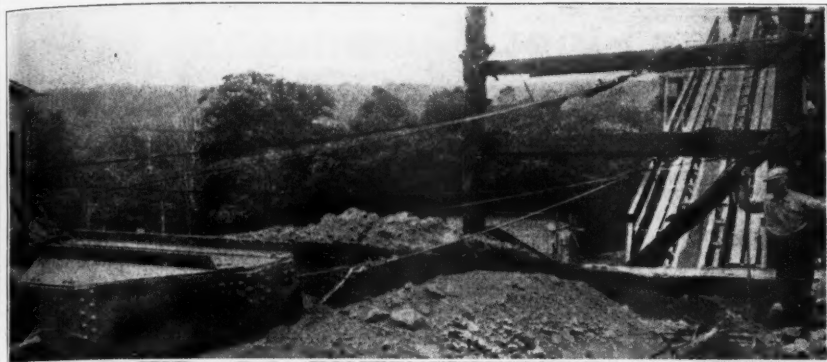
The Cedar  
Cedar G  
scraper  
the bal  
with a 1  
Oil Eng  
Let us

VEN  
1317 V

Other  
REVOL  
ELEVA  
AND E  
CAST

Special  
drawing  
Send





The Cedar Grove Sand and Gravel Co., Cedar Grove, N. J., operate this 3 yard scraper and a 150 KVA generator for the balance of the plant power—all with a 185 H.P. type D Venn-Severin Oil Engine.

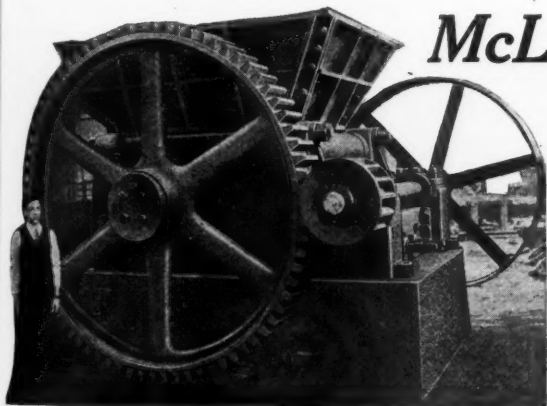
Six gallons of fuel oil per hour (42 cents @ 7 cent oil) does all this work. Beats current at 1 cent per Kilowatt. And there have been no troubles because combustion is clean; there never has been carbon accumulation to clean out.

*Let us show you what a Type "D" Vinn-Severin Oil Engine will save in your power cost*

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**VENN-SEVERIN MACHINE COMPANY**  
1317 WEST NORTH AVENUE CHICAGO, ILLINOIS

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## McLanahan's Single Roll Crushers

and Complete Equipment for Crushing Plants have long been known for quality and dependability in primary and secondary crushing.

These crushers are manufactured by us for over 25 years, are strong and well-built, gearing is *e x t r a* heavy, the roll shell is a solid cylinder of chilled charcoal iron. It is simple in construction; all parts are accessible for inspection or repairs; adjustment to different size easily made; has wide range of output; less fines; low height compared with gyratory; less first cost, considering capacity; economy in operation—requiring little or no labor in feeding. The ideal crusher.

### Other McLanahan Equipment

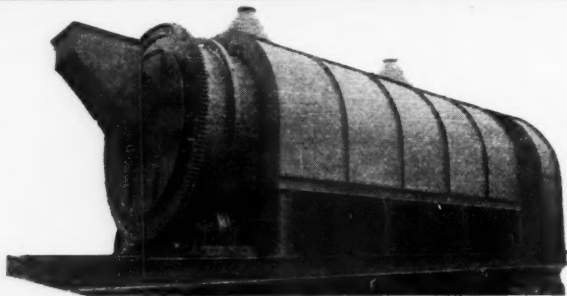
REVOLVING SCREENS — CONVEYORS AND ELEVATORS — WASHERS — ELECTRIC AND BELT DRIVEN HOISTS — MINE CARS, CAST IRON TRACK FROGS, SWITCHES, ETC.

Special Machinery made from specifications and drawings to suit customers' requirements. Send for our descriptive literature.

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**McLANAHAN-STONE MACHINE CO.**  
HOLLIDAYSBURG, PA.

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## Efficiency and Profit

The Continuous Cement Bag Cleaner can produce both for you.

The machine is labor-saving in performance, thereby increasing the efficiency of your mill.

The Continuous Cement Bag Cleaner will in addition, reclaim one pound of cement per bag and has a capacity of from 2,000 to 10,000 bags per hour.

*Write us for further details*

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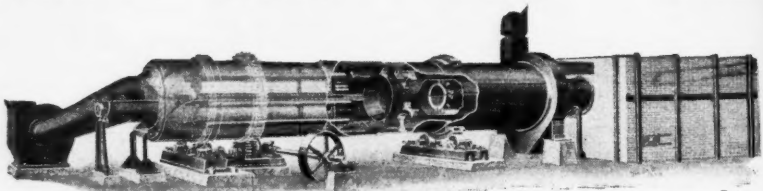
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The patented inner tube is responsible for the unvarying success of Buckeye Type B Dryers.

**DIRECT-INDIRECT FIRED USING COAL, COKE OR OIL  
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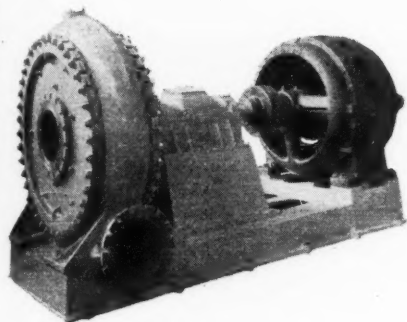
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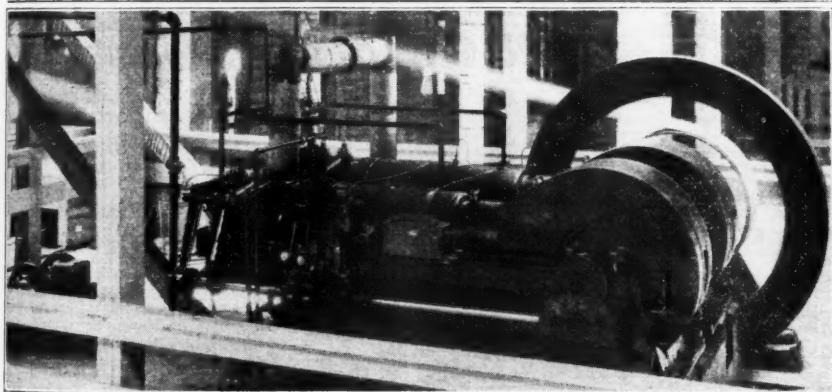
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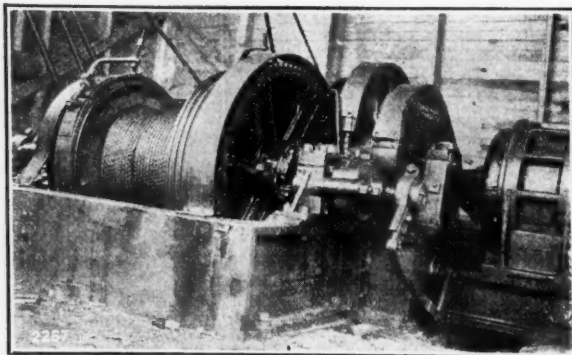
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That stands severe working strains.

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That gives good digging.

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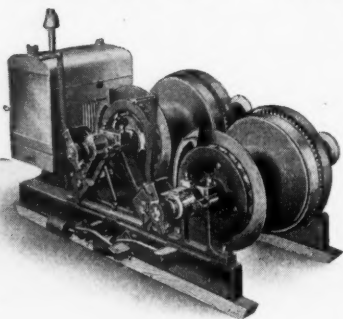
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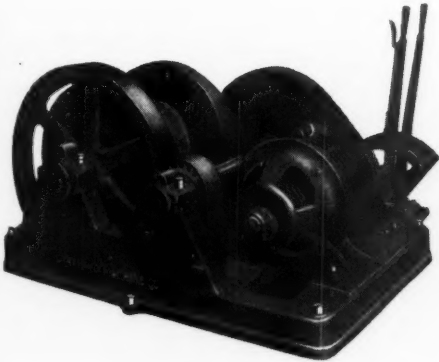
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Established 1885

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Built in  
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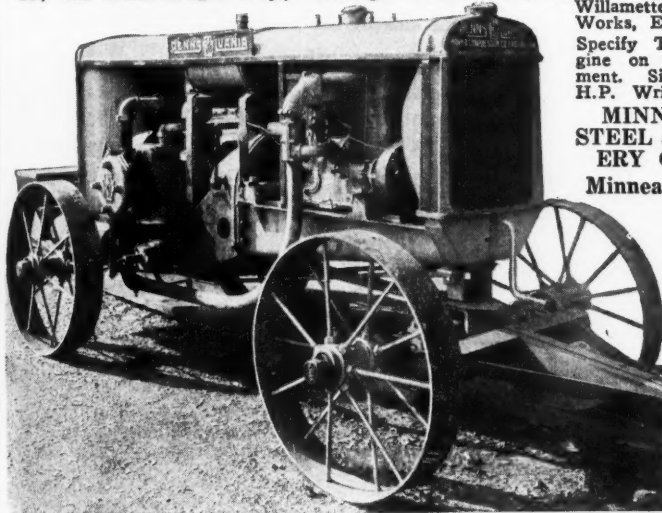
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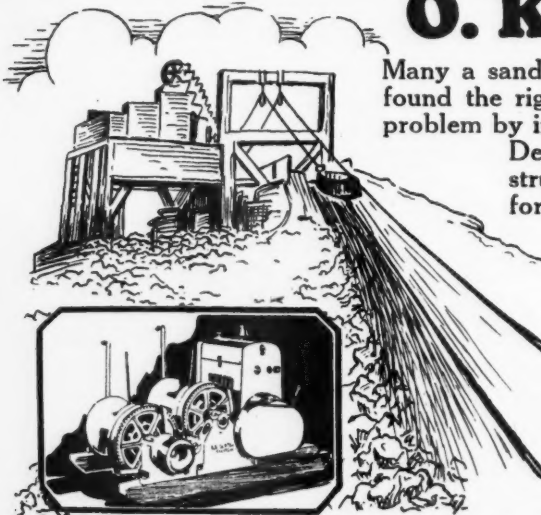


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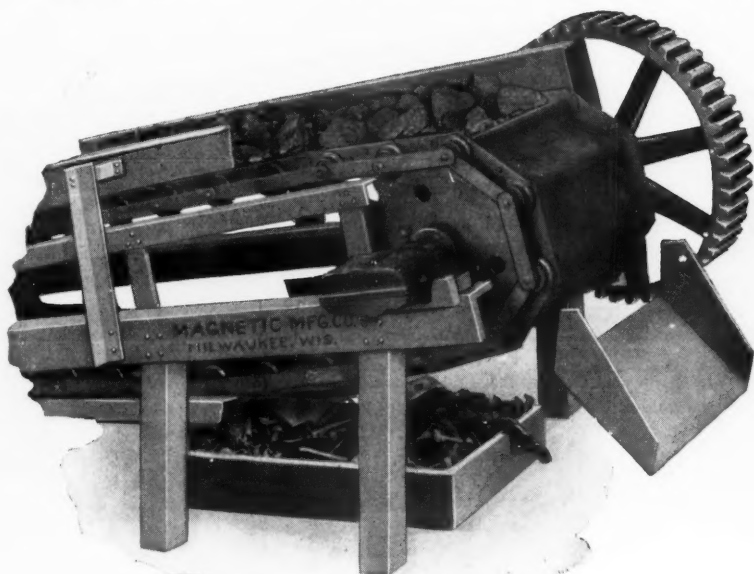
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